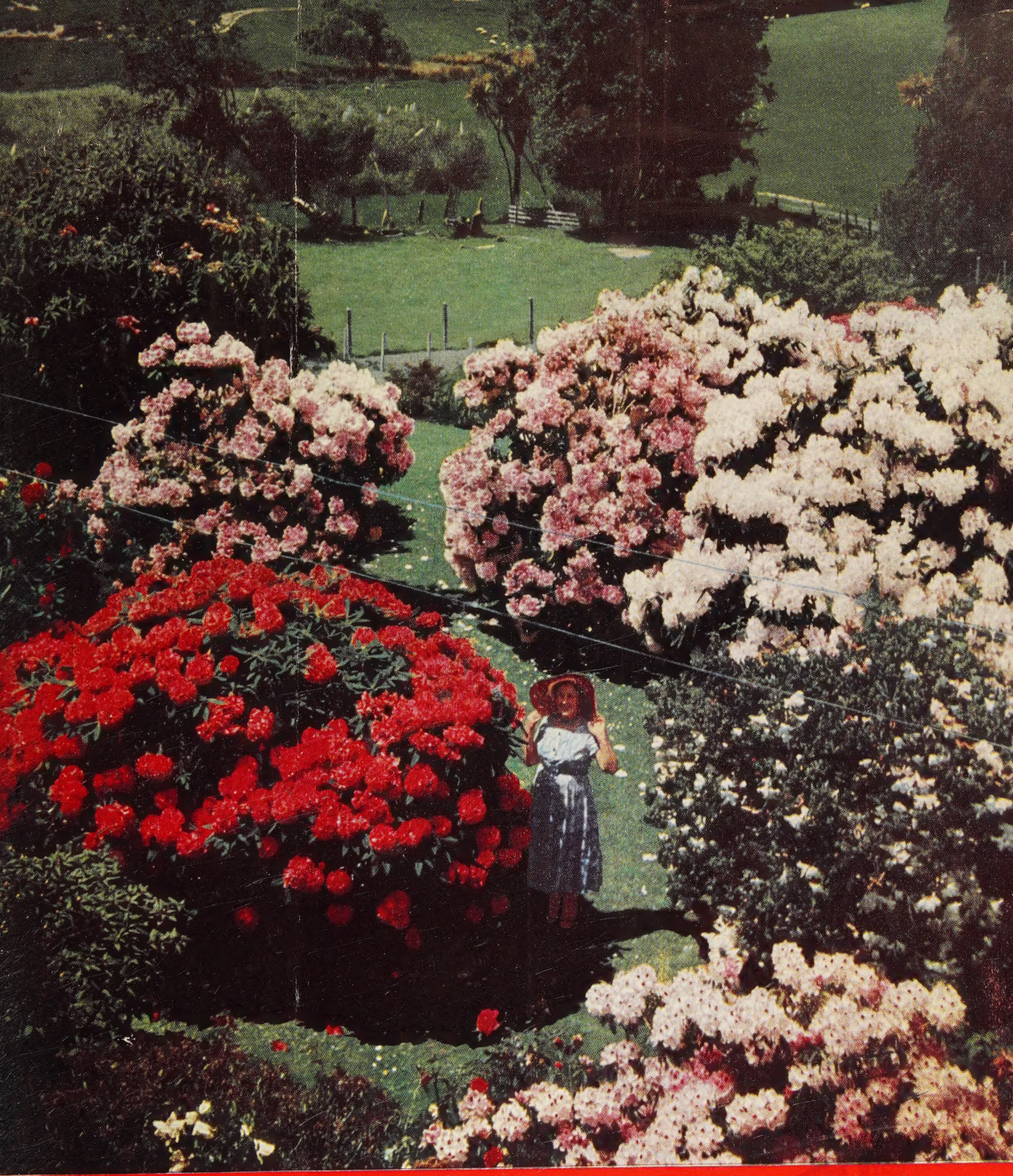

NEW ZEALAND
JOURNAL OF

AGRICULTURE

OCTOBER
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Journal of Agriculture

Vol. 101 No. 4 15 October 1960

Editor: G. J. Neale P.O. Box 2298, Wellington

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Rhododendrons and azaleas, shown on our cover this month, are among the most popular of ornamental bushes in New Zealand. The extensive garden areas surrounding many farm homesteads allow adequate scope for brilliant displays of them, as in this Wakefield, Nelson, garden. Many species were collected originally by botanists in western and central China, who took them to Europe, where their beauty stimulated interest in further search for them in the remote interior of China.

[*Ellis Dudgeon photograph*

SUBSCRIPTIONS

Within N.Z.: 10s. a year.

Overseas: 13s. (sterling) a year.

Payable at any office of the Department of Agriculture.

The "Journal" may be ordered from any bookseller or newsagent.

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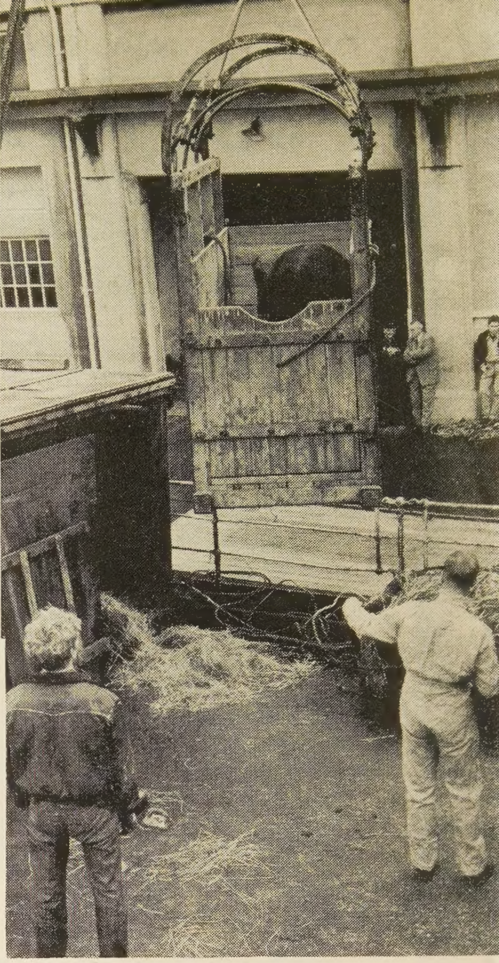


Quarantine Restrictions Hold Back Threats to Our Livestock

ONE compensation for the great distances which separate New Zealand from its principal export markets is that these ocean stretches have reduced the risk of introduction of serious animal diseases. Isolation alone, however, would not have sufficed to keep virulent diseases out and it is fortunate that quarantine restrictions were imposed at a relatively early stage in this country's development. Control has been tightened over the years and as a result of the precautions taken New Zealand, one of the world's biggest exporters of animal products, is free of all the most serious infectious livestock diseases. Present quarantine procedure and the reasons for various restrictions are described in this article by P. J. LEE and J. D. TENQUIST, both of the Department of Agriculture, Wellington.

CONTROL OF SERIOUS DISEASES

THAT so few major diseases of stock entered New Zealand in early colonial times, when there was virtually no safeguard except that imposed by voyages in sail of weeks or perhaps months, was simply a matter of luck. That some of the serious diseases which did break out were eradicated was due to the thoroughness of Government officers then responsible for recognition and control of disease.

Sheep Scab and Bovine Pleuro-pneumonia

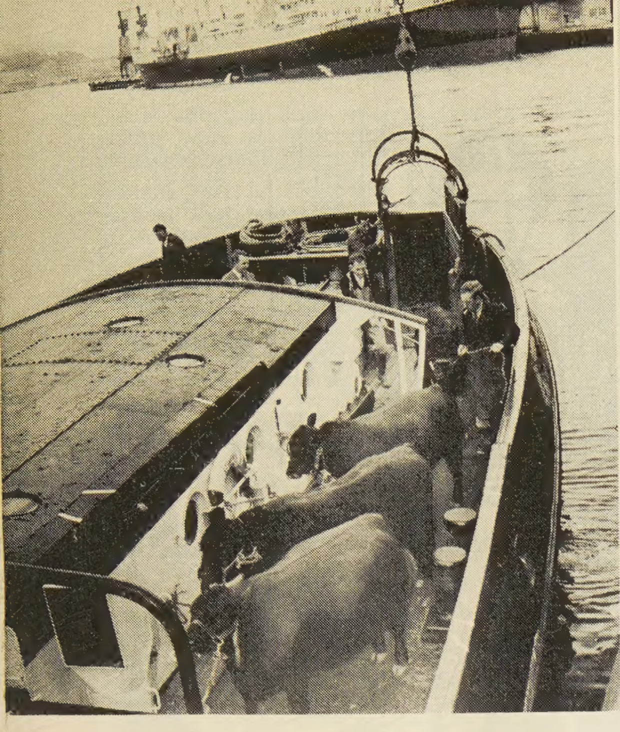
Sheep scab was known in New Zealand as early as 1850 and bovine pleuro-pneumonia was introduced in 1864. Fortunately bovine pleuro-pneumonia was recognised as serious and was stamped out. A slaughter policy was recommended by the veterinarian who diagnosed the disease in the South Island area where it occurred and fortunately his advice was adopted. The same advice given to the Government in Victoria in 1858 was not followed. Had it been, Australia would most likely have been spared a costly legacy.

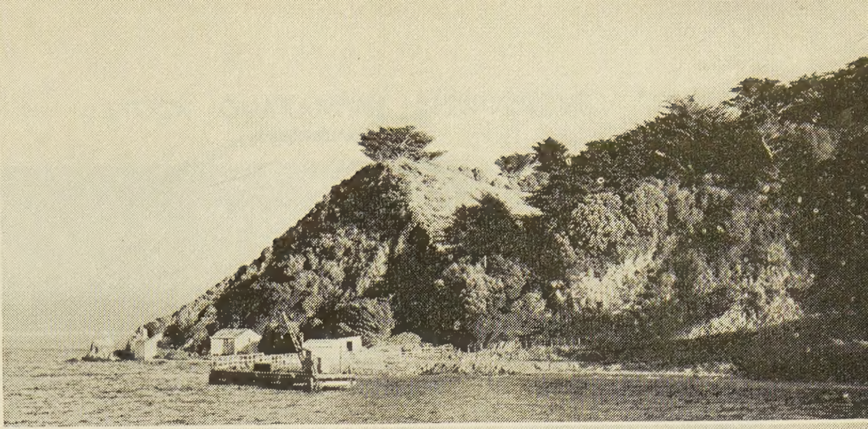
By any standards, but especially in the era of very limited veterinary aid in which it was accomplished, the eradication of sheep scab from New Zealand was an outstanding achievement. The fight against sheep scab lasted for seven years and involved large-scale dipping and later wholesale slaughter.

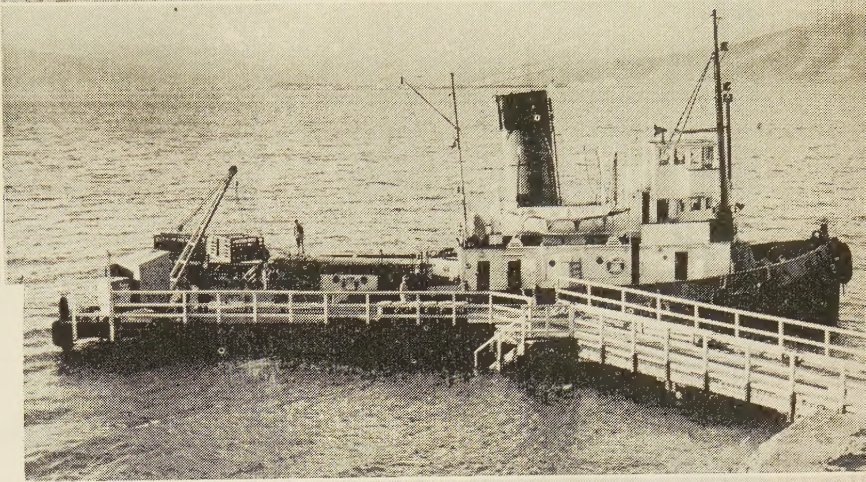
Sheep scab was not seen after 1885. Its persistence would undoubtedly have interfered seriously with the steady growth of New Zealand's sheep flocks from a total of about 16 million in 1885 to 47 million 75 years later.

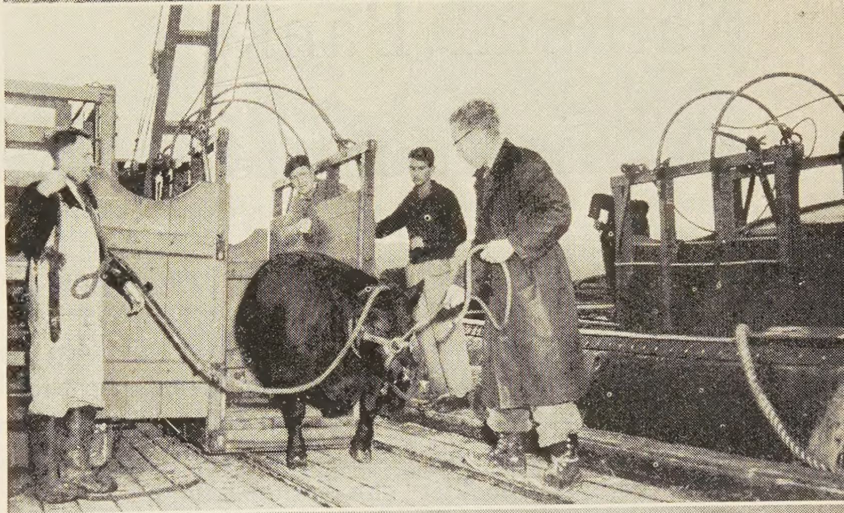
Anthrax

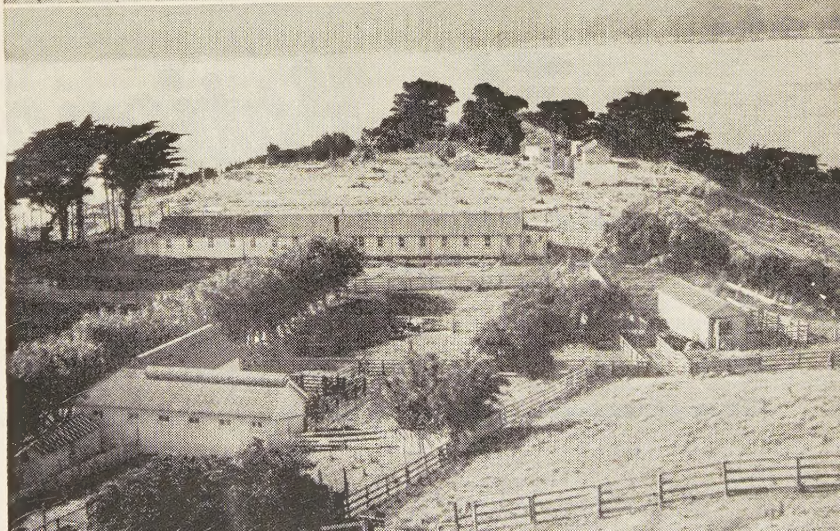
The presence of anthrax was recognised on several farms in the 1890s and from 1900 to 1907 it was reported from widely separated parts of the North Island and in one instance in











OPPOSITE PAGE: Left—Veterinary inspection of bull before unloading from overseas vessel. Right—Bull being unloaded in crate, which is taken by motor lorry to the boat on which stock is transferred to Somes Island Quarantine Station.

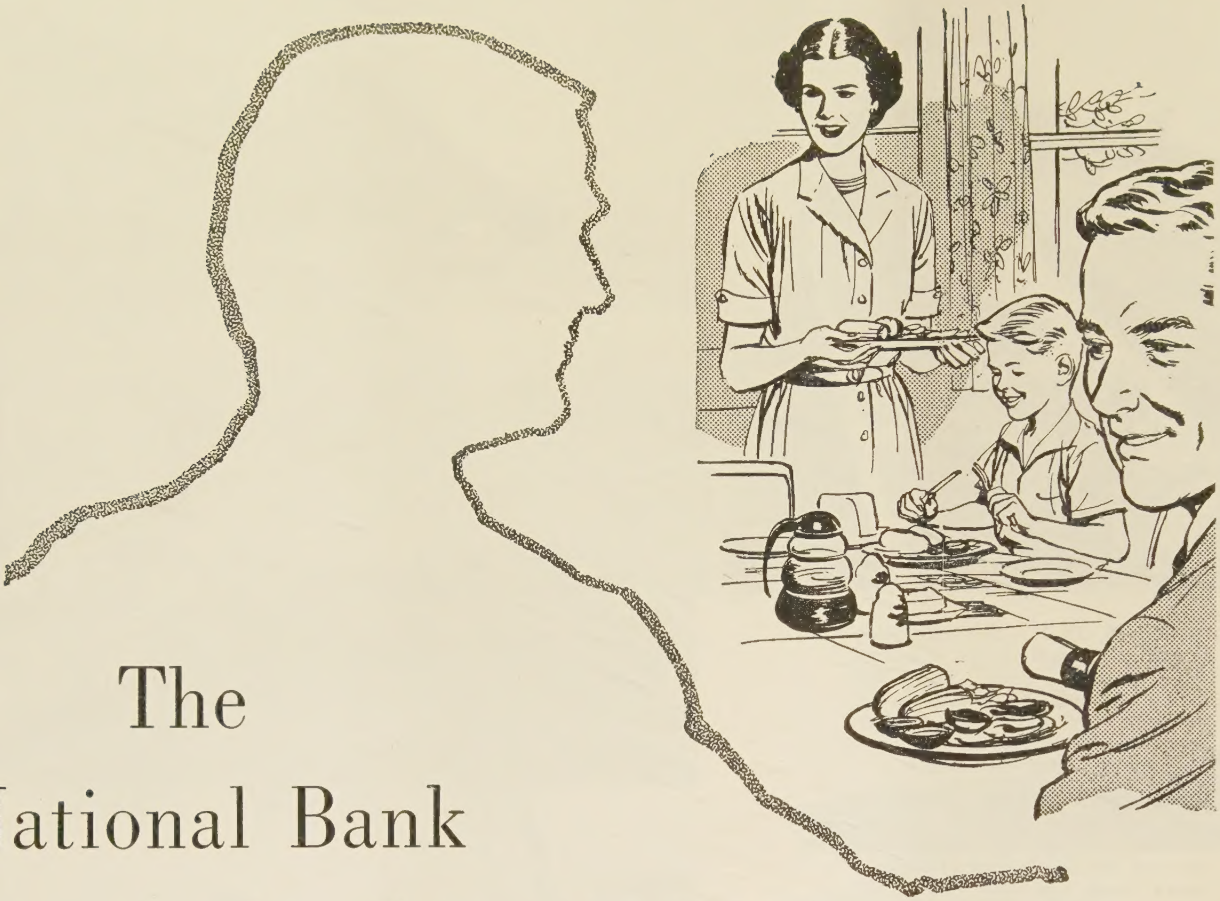
THIS PAGE: Upper left—Cattle embarked for Somes Island. (In this instance a tug was being used because the Department of Agriculture's launch was under refit.) The overseas vessel from which the stock were unloaded is in the background. Upper right—The landing, Somes Island. Middle right—Two views of unloading. Bottom right—The quarantine area on Somes Island.

Southland. It was concluded that this disease had been introduced with imported unsterilised bone manure, and importation of this material was prohibited.

Since 1907 isolated outbreaks have been reported, the last about six years ago on two properties where anthrax had occurred 51 years before. On the few farms where the disease has been diagnosed stock is vaccinated annually, which effectively controls the disease.

Swine Fever

Swine fever was recorded in New Zealand between 1895 and 1902, but no cases were reported during the next 30 years. Then in 1933 the disease occurred among garbage-fed pigs in piggeries at Johnsonville (near Wellington) and Lower Hutt. Though very close inquiry did not discolse the way in which the infection reached Wellington, there was a very strong suspicion that the virus was transmitted in garbage from an overseas ship, despite the fact that the removal of such garbage had been prohibited by regulation for some years.



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All affected and in-contact pigs (1,920) were slaughtered and all the piggeries demolished and burnt.

Since that outbreak the control of garbage feeding has been strengthened, all feeders of garbage being required to be licensed and cooking of all garbage being made compulsory.

The last outbreak of swine fever occurred on an unlicensed piggery in the Auckland district at which uncooked garbage was being fed. Prompt control measures, including the slaughter of all the surviving pigs and burning of the carcasses, stamped out the disease.

Scrapie

Scrapie disease in sheep occurred in New Zealand for the first time in 1952 in the Rakaia district. Because the farmer owning the sheep, which had been imported from England two years before, sought veterinary assistance immediately the first symptoms were noticed, the Department of Agriculture was able to take early action. Though a second outbreak occurred in Southland, adequte measures were taken to deal with both outbreaks and no further cases of the disease have been reported.

A.B. May Have Far-reaching Effects on Animal Importation

ARTIFICIAL breeding may have far-reaching effects on importation of animals into New Zealand.

At present A.B. is used widely only with dairy herds, but it has already resulted in virtual cessation of the importation of dairy cattle. Semen is being imported instead of the breeding animals. Such importations are governed by quarantine regulations. Semen must come from animals that are under official control and have passed a series of tests. It is all held for an appropriate period at the New Zealand Dairy Board's Artificial Breeding Centre, Newstead. If in the meantime an outbreak of foot and mouth disease occurs on the farm of origin, the semen is destroyed.

Though A.B. is widely used only with dairy cattle, the practice of importing semen may easily be extended to beef cattle breeding or to sheep, for which A.B. is extensively used in the U.S.S.R. With some types of animals commercial use of A.B. is at present restricted by technical problems. It seems likely, however, that use of A.B. eventually will almost obviate the need for importing the main types of farm animals.

ATTENTION PLEASE!
ALL PERSONS VISITING IMPORTED STOCK ABOARD THIS SHIP MUST DISINFECT

Persons inspecting imported stock while it is on board the overseas vessel must disinfect their footwear in a footbath at the head of the gangway.

Mucosal Disease

The most extensive disease control restrictions ever enforced in New Zealand were imposed early in 1959 as a result of an outbreak of a disease in which both clinical and post-mortem findings were different from any disease then known. After exhaustive tests and investigations at the Department of Agriculture's Wallaceville Animal Research Station the disease was diagnosed as mucosal disease.

It had striking resemblances to rinderpest (cattle plague) and until this possibility could definitely be ruled out, precautions had to be based on those acceptable for rinderpest control. Less stringent measures were considered adequate when more was known about the nature of the disease. At first considerable numbers of stock had to be slaughtered, but later this policy was modified and eventually the disease died out. There was never any indication that this disease had been introduced, though similar types of disease had been recorded in overseas countries.

Threats Overcome

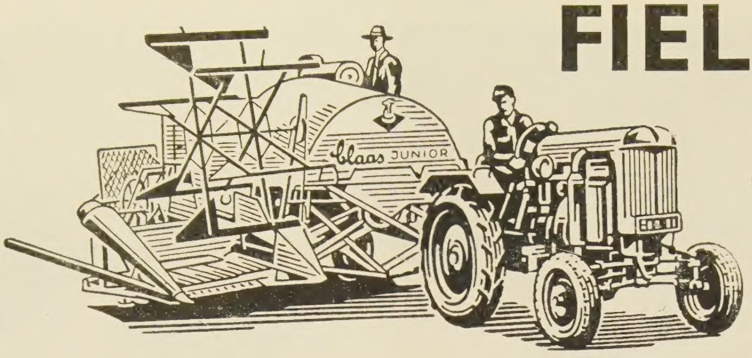
During the last 100 years therefore we have disposed of several quite serious threats to our livestock population. Unfortunately they loom more threateningly today than ever because of the rapidity and volume of air traffic in all parts of the world. Accordingly quarantine restrictions were never more important.

IMPORT PROCEDURE

Anyone wishing to import an animal must first obtain an import permit from the Department of Agriculture. Countries from which importations of stock are permitted and quarantine periods which they have to undergo

FIELD TESTED

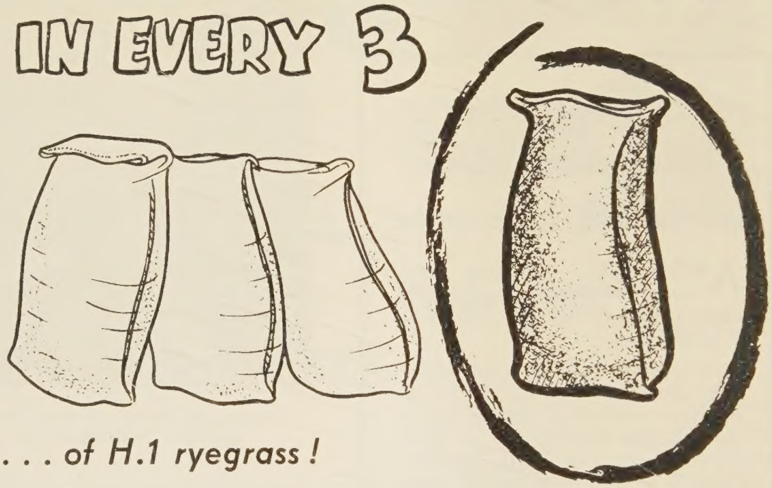
. . . by a contractor against all comers . . .



Claas Junior.

. . . actually produced . . .

ONE EXTRA SACK IN EVERY 3



. . . of H.1 ryegrass !

THIS ACTUALLY HAPPENED !

The owner of a CLAAS SUPER JUNIOR COMBINE, a Canterbury contractor, recently placed an order for a second CLAAS COMBINE, this time a CLAAS 10 ft SELF PROPELLED.

It is interesting to know why this contractor has bought a second CLAAS COMBINE. The answer is very simple—his CLAAS JUNIOR COMBINE far exceeded the makers' estimate as to output. In a crop of H.I. ryegrass of considerable size, four combines were engaged in harvesting the crop. Two were 10 ft machines, one 8 ft 6 in., and the CLAAS SUPER JUNIOR was 7 ft.

The CLAAS owner soon noticed that on each round his combine was dropping 4 bags as against 3 from each of the other 3 combines. In addition to this, the sample from the CLAAS was heavier than from any of the others !

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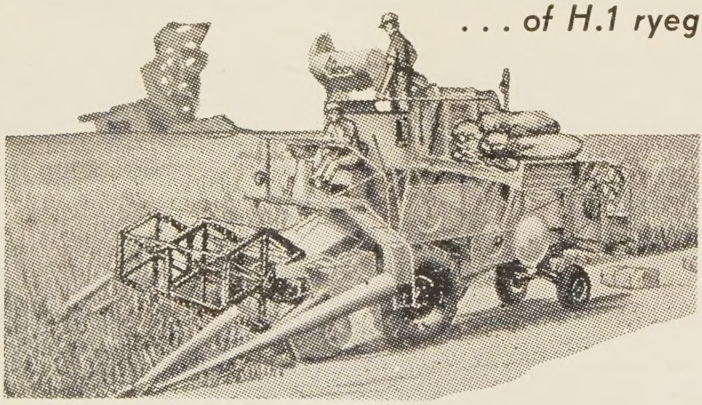

Self-propelled model in operation.

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- Many samples from CLAAS COMBINES have gone to the merchants and been taken for machine dressed seed.
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Cars used overseas and brought to New Zealand are cleaned under Department of Agriculture supervision before going into service.

in New Zealand are set out in a panel on this page.

On arrival in New Zealand animals are subjected to veterinary inspection by Departmental officers and then those which have to be quarantined (see panel below) are transferred to Somes Island.

The crate that the animal was in is thoroughly cleaned and disinfected before being allowed off the wharf. All bedding straw and hay and other foodstuffs used on the voyage either return with the ship or are burnt under Departmental supervision.

Animals on arrival at Somes Island are immediately taken to the quarantine area and remain there for the requisite quarantine period.

Somes Island

Somes Island, in Wellington Harbour, six miles from the City of Wellington and about two miles from Petone beach, is ideally situated for a quarantine station.

The island is run as a farm with about 100 locally bred sheep for the control of pastures. No stock are sold publicly, excess sheep being transferred as required to Wallaceville Animal Research Station.

The actual quarantine area on the station is double fenced, and imported animals are kept apart from one another during their entire stay on the island. If necessary, any animal can be completely isolated from the rest of the stock. When there are different consignments at the station at the same time, such as stock from Great Britain and Australia, the officer in charge changes overalls and boots before going from one consignment to the other to prevent any possibility of passing on infection.

The public are not permitted to land on Somes Island.

Other Disease Precautions

Meat, except canned meat accompanied by a sterilisation certificate, is not permitted into New Zealand. This restriction is necessary because of the ease with which virus diseases particularly could be introduced, some even in prepared foods that had been boiled. Before any canned meat is imported, whether commercial quantities or personal parcels, a permit must be obtained from the Department of Agriculture.

Sacking or straw used to protect imported goods must be certified as new (except sacks used for goods from Australia and Pacific islands) and free from infection; otherwise it is destroyed under supervision of the Department of Agriculture.

Cars used overseas and brought to New Zealand are cleaned under Department of Agriculture supervision before going into service.

Garbage from overseas ships is loaded into a collecting vessel and dumped not less than three miles out to sea or in a few ports burnt in incinerators. Garbage from overseas aircraft is burnt in incinerators on the aerodromes.

Air Transport

Transport of stock to New Zealand by air is not permitted and is never likely to be. This is because of the high risk of disease organisms surviving the short duration of such flights.

Nevertheless a close watch is kept on aircraft arriving in New Zealand and any materials on which disease organisms might be transmitted are disposed of or treated.

Permitted Importations and Quarantine Periods

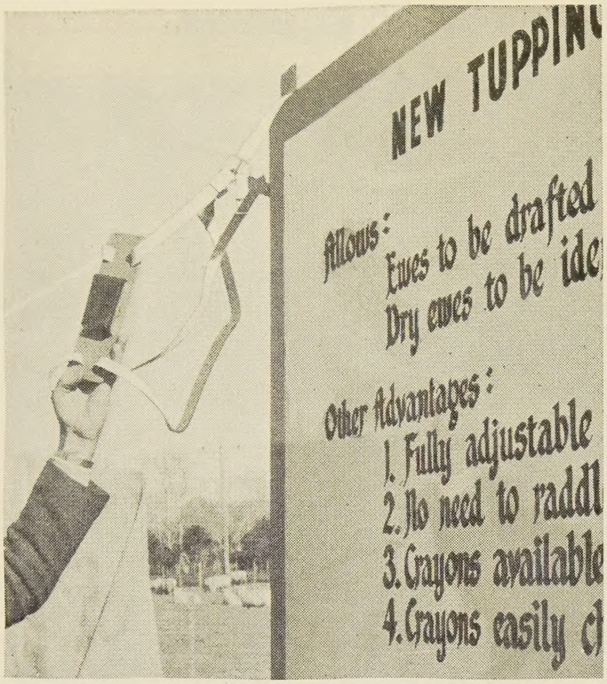
COUNTRIES from which importation is permitted and quarantine periods on Somes Island are as follows:

	Imports permitted from	Quarantine period days
Cattle	U.K., Eire, Tasmania	30
Sheep	Part of N.S.W., Victoria, S. Australia, Tasmania	None
Horses	U.K., Eire, part of N.S.W., Victoria, S. Australia, Tasmania	None
Pigs	Northern Ireland, N.S.W., Victoria, Tasmania	30
Goats	Australia	30
Dogs	U.K., Eire, part of N.S.W., Victoria, S. Australia, Tasmania	None, but 60 days' segregation on owners' property
Cats		
Tropical fish (aquariums)	Most countries (under permit)	None
Birds (canaries and pigeons only)	Australia	None

Because entry of sheep, horses, cats, and pigeons and canaries is restricted to a few areas from which they can be imported safely, these animals are not quarantined on arrival in New Zealand. All importations must be accompanied by a health certificate issued in the country of origin and are subject to close veterinary inspection before being released or transferred to Somes Island.

ROUND THE RESEARCH STATIONS

Current Work and Findings in Department of Agriculture and Department of Scientific and Industrial Research Trials and Experiments



Ruakura

Ram Raddling Harness

A number of research workers in both New Zealand and Australia have attempted to develop a method of identifying ewes at mating. The method most commonly used at present involves applying a coloured material, in the form of a tupping paste, to the brisket of the ram. However, this material has to be applied at least every two to three days throughout tupping and in consequence is not often practicable under field conditions.

Workers in Australia have recently developed a suitable harness which holds a breast-plate between the forelegs of the ram. A metal crayon-holder is riveted to this breast-plate and a coloured crayon with a metal base fits neatly into the crayon-holder and is held firmly in place with a split pin.

Crayons of different degrees of hardness are made for use under cold, mild, or hot conditions. Under Australian conditions each crayon will last at least a fortnight, when it can be replaced with one of a different colour. Four different colours are available.

Use of this type of harness enables complete tupping records to be kept with comparatively little extra effort.

Because of the obvious practical advantages the method is being tested out at Ruakura Animal Research Station.

HEADING PHOTOGRAPH: The ram raddling harness which is being tested out at Ruakura.

Rukuhia

Sulphur in Air and Rainfall

Over the past few years it has become increasingly evident that many soils in New Zealand are deficient in sulphur. The lack had been masked by the very general use of superphosphate, which supplies phosphorus and sulphur in similar amounts. A wide survey of the chemical composition of air and rainfall in western Europe revealed that coastal regions receive appreciable sulphur from sea spray and that in industrial areas rain may contain sufficient sulphur for plant requirements.

The Rukuhia Soil Research Station has been determining the sulphur in air at Rukuhia and Winchmore and in rainfall at six stations, Rukuhia, Marton, Winchmore, Broken River, Tara Hills, and Invermay. The amounts recorded in rainfall in 1959 were very low and ranged from 0.4 lb per acre at Tara Hills to 2.8 lb at Rukuhia. Amounts measured in the air at Rukuhia and Winchmore were similarly low. None of the sites is affected appreciably by industrial smokes and most are a considerable distance from the sea. It seems that over much of New Zealand sulphur contributions by way of rainfall or air are negligible.

Levin

Rimu Sawdust in Soil Mixes

Further work on the use of the U.C. (University of California) soil mixes (organic matter and fine sand with fertilisers) for raising seedlings has been done at the Horticultural Research Station, Levin, since that reported in the August issue of the "Journal".

Results show that rimu sawdust can be used as the organic matter in these mixes provided extra nitrogen is added to the fertiliser mixture recommended by the University of California. Best results were obtained from the use of equal parts of rimu sawdust and fine sand. To every cubic yard of mix is added:

- 4 oz of potassium nitrate
- 6 oz of sodium nitrate
- 4 oz of potassium sulphate
- 2½ lb of superphosphate (18 per cent)
- 7½ lb of dolomite lime
- 2½ lb of ground limestone

The ingredients were mixed together and then sterilised with steam. The compost can be stored indefinitely and is equally suitable for sowing seeds or pricking out seedlings.

Wallaceville

Dieldrin Resistance in Sheep Blowflies

Over the past two seasons sheep blowflies in several localities in New Zealand are suspected to have developed a resistance to dieldrin. Work at Wallaceville Animal Research Station has now confirmed that at least in Marlborough, Nelson, Hawke's Bay, and Poverty Bay dieldrin-resistant strains of *Lucilia sericata*, the sheep blowfly, do exist.

The degree of resistance has been found to vary from 20 to 200 times that of normal flies. This has been determined by placing small measured quantities of insecticide on the bodies of young adult flies under standard conditions and noting the mortality rate. In flies that were bred of these strains free from contact with the insecticide the resistance disappeared fairly rapidly at first but then more slowly, so that some resistance still remained even after six generations.

Soil Bureau and Farm Advisory Division

Residual Effect of Phosphate Topdressing

The residual effectiveness of phosphate topdressing on pasture growth in the years after that in which it was applied has been measured in a field trial on a yellow-brown loam in North Taranaki by comparing the response on plots topdressed in previous years with the response on plots freshly topdressed.

In August of four successive years a set of plots was topdressed and a good response was obtained throughout the year, 10 to 15 per cent in spring rising to 25 to 50 per cent in autumn and winter. The residual effect of the phosphate applied in previous years was very high in spring, the pasture response equalling that on the freshly topdressed plots. In contrast the residual effect in autumn and winter was small; there was some response, but it was small compared with that on the plots topdressed that year. These results indicate that high autumn and winter pasture production needs annual phosphate topdressing before autumn growth begins, preferably in late summer or early autumn.

Rukuhia

Soil Sampling in Tomato Glasshouses

Where trickle irrigation is used, small quantities of fertiliser are normally applied in solution at each watering. Early in the season the concentration of fertilisers applied in solution is relatively high, especially in potash, but later in the season much weaker solutions relatively high in nitrogen are normally used; for the last few weeks of the crop it is common practice to use pure water only.

The effect of this spot application of water and fertiliser is being studied in some detail because of the evidence of resulting large differences in concentration of soluble salts in different positions in the plant beds.

Wallaceville

Radioactive Isotopes and Research

Radioactive isotopes have many applications in agricultural research. Some used at Wallaceville are

Radioiodine

The working of the thyroid gland can be checked by the way in which it deals with radioiodine when this is injected into the animal. When ewes are fed on kale their lambs may be born with goitre and in Australia milk from cows fed on kale produced goitre in school children.

The radioiodine test is being used to measure the effect of the kale or the milk produced from it on the thyroid glands of sheep and rabbits.

Radioselenium

The amounts of selenium in the tissues are minute and it is very difficult to follow it in the animal by ordinary means. The use of radioactive selenium is of great help in investigations in this field. When radioselenium is given to sheep their kidneys take up much more than other tissues and these and several other tissues, such as liver, have high concentrations of radioselenium as soon as two hours after its injection. Though these levels fall considerably they are still quite high after a month.

Radioactive Lice

To hunt through the fleece of a sheep for a few lice is a very laborious process, but if they are made radioactive, they can be found quite easily by a Geiger Muller counter and their movements through the wool followed. To make them radioactive small blobs of radioactive paint are placed on their backs with a fine wire. This of course has to be done under a microscope, as the louse is small and only a little more than a millionth of an ounce of paint is used on each one.

Effect of Potato Virus Y on Ilam Hardy Variety

By J. A. S. MILLER,
Farm Advisory Officer (Seed Certification), Department of Agriculture,
Palmerston North

DURING the last two or three years potato growers, particularly in North Canterbury, will have become familiar with use of the term virus Y to describe an infection of stocks of Aucklander Short Top potatoes.

PUBLICITY has been given to the introduction of a selection of Aucklander Short Top known as virus Y-free, and several growers have already had experience with it. The elimination of virus Y from these stocks has had a beneficial effect on the yield. It is apparent, therefore, that virus Y, though exhibiting no marked foliar symptoms in the Aucklander Short Top variety, is a very potent yield reducer. Yield reduction is a characteristic effect of infection by potato viruses, as growers whose crops containing plants exhibiting the symptoms of leaf roll and mosaic will testify.

Virus Y, like the leaf roll virus, is spread from plant to plant and from crop to crop by sap-sucking insects such as aphids or greenfly. A healthy plant does not generally react immediately to this infection and may go through the whole season without showing any sign. By the end of the growing period, however, the infected sap will have reached the tubers, and if these are planted in the following season, the characteristic symptoms peculiar to the virus will appear in the foliage.

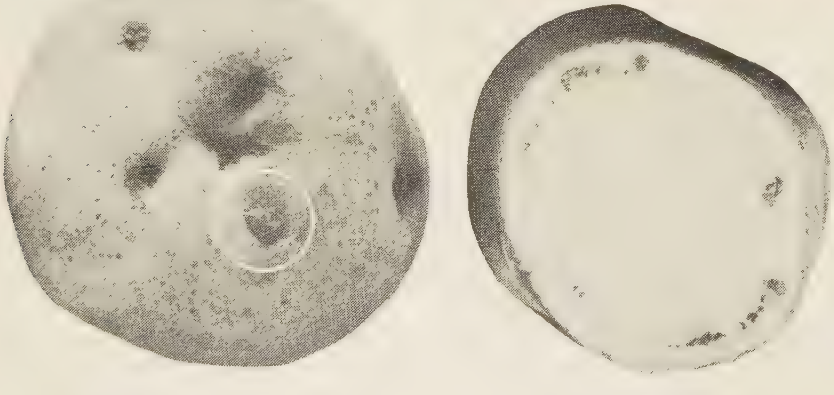
The reaction of the Ilam Hardy variety to infection by virus Y is immediate and violent. In most instances the area of the plant near the point of entry of the virus dies and the virus dies with it. If the virus succeeds in penetrating to the tubers, the eyes will be killed and thus the virus-infected tuber is prevented from reproducing itself in the following season. This characteristic of Ilam Hardy is known as "field immunity" to virus Y. The virus is automatically eliminated and it follows that all stocks of the Ilam Hardy variety are free from virus Y.

The "eye blinding" effect of virus Y on the Ilam Hardy variety was first brought to the notice of the Department when a farmer in the Opiki district of the Manawatu noticed on digging his crop that some of the tubers had a black discolouration of the eyes. This effect was sufficiently noticeable to enable him to reject these tubers when he was bagging the crop. When the eyes were cut through with a knife they were found to be dead and some were rotting. From these eyes radiated blackened veins which extended some distance into the flesh of the tuber, rendering it unfit to eat. Such tubers being "blind" were also useless as "seed".

As this condition had not previously been seen by field officers of the Department, infected tubers were forwarded to C. M. Driver of the Crop Research Division of the Department of Scientific and Industrial Research, who identified the condition as being caused by virus Y and indicated that any healthy eyes on a tuber with "blind" eyes would have escaped infection and would produce a normal plant in the following season.

The detection of virus Y in this crop indicated the presence of a reservoir of virus Y near it, and it was later found that the crop was indeed planted near a crop of Aucklander Short Top. Aphids had done the rest.

Control is thus relatively simple. Ensure that no Aucklander Short Top is grown in the immediate vicinity of Ilam Hardy. The greater the distance between the two is, the less chance there is of infection.



LEFT—Most of the eyes on this tuber, which are blackened, have been killed as the result of virus Y infection. The eye within the circle has escaped infection and would produce healthy growth in the following season. RIGHT—A cut tuber, showing the blackened areas caused by infection with virus Y.

Farmers Warned Not to Buy Boron-treated Fence Battens

FARMERS are warned not to buy boron-treated fence battens, as boron treatment is not satisfactory for material exposed to the weather. The boron compounds are readily leached out and this leads to insect attack or rots.

The terms "dipped" and "cured" are being used to describe the boron-treated battens. "Preservative treated" is the description applied to an effective preservation treatment, but by law this can only be used to signify a treatment approved by the Timber Preservation Authority. At present the only approved preservatives for fence battens are:

For vacuum pressure method: Creosote, pentachlorophenol, "Boliden K33", "Boliden S25", "Celcure A", "Tanalith C", and "Tanalith CA".

For hot and cold bath methods: Creosote and pentachlorophenol.

Farmers when buying treated battens should make sure that they have been treated by one of the approved methods and materials listed.

Control of Cattle Ticks with DDT Superphosphate

By F. B. MULLER,

New Zealand Fertiliser Manufacturers' Research Association

CATTLE ticks are a problem mainly in the warmer areas of Auckland Province, particularly in the Gisborne area and North Auckland, on broken country which cannot always be kept closely grazed. While deaths of animals due to the severity of tick infestation are not common, other losses which are not so obvious may be quite costly. Loss of milk production, ill thrift in lambs and hoggets, and damaged sheep and cattle hides all constitute a real loss of income. The damage to bobby calf pelts alone runs into many thousands of pounds annually.

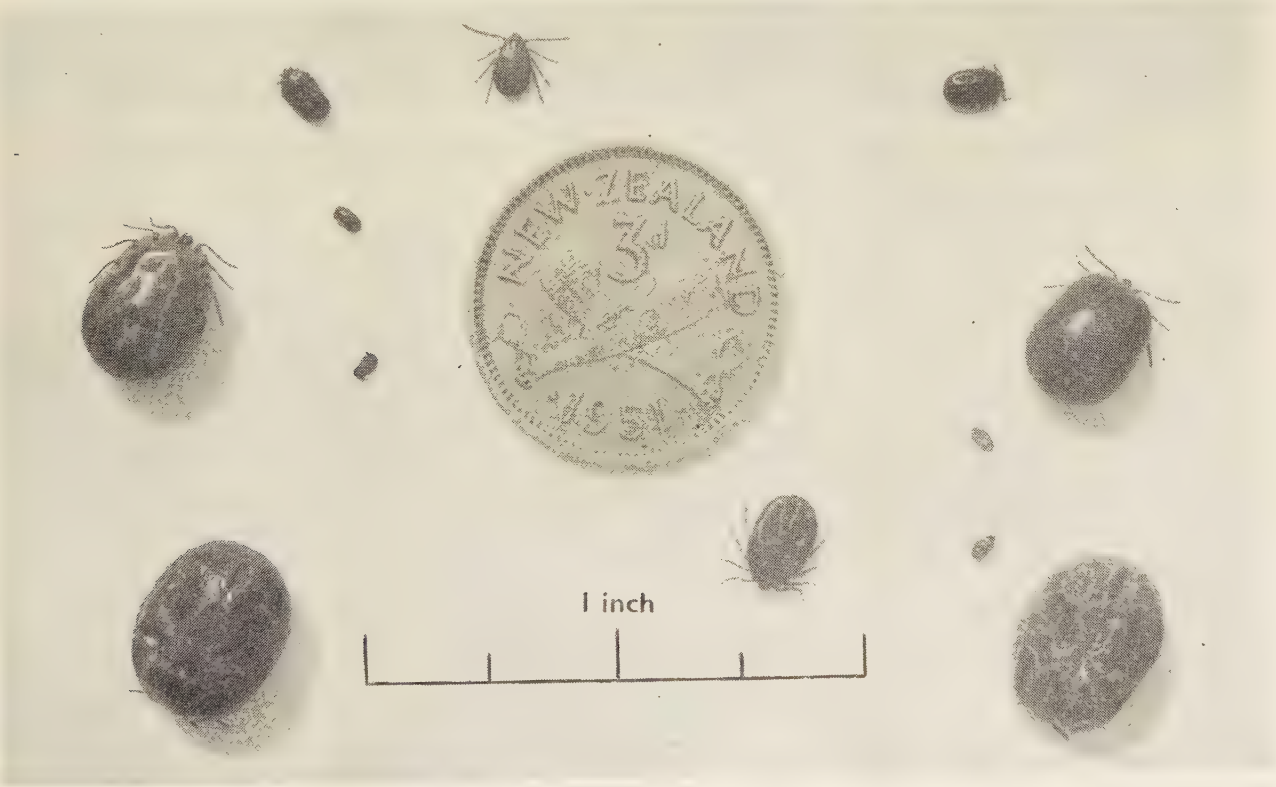
THIS species of tick (*Haemaphysalis bispinosa*) is a three-host parasite; that is, it feeds on an animal, drops off, changes over to the next stage, and repeats that twice more on the same or different animals, depending on what happens to be passing by. The changing over to the next stage, or moulting, takes place on the surface of the ground, or just under it, when the insect is protected by rough herbage. Paspalum, sedges, and rushes are particularly suitable as cover during this phase.

Occurrence

Ticks, which are of the same group as the spiders and have eight legs except in the larval stage, bear no relation whatever to the keds, which are insects, have six legs, and inhabit the cooler parts of the country. *H. bispinosa* is a tropical species which found its way to New Zealand in the 1900s and which the climate has kept from establishing in large numbers further south than Te Kuiti-Gisborne.

Ticks are troublesome mainly in hill country in northern Poverty Bay and in the North Auckland peninsula. Each female tick lays 3,000 to 5,000 eggs and if weather and cover are favourable, ticks may soon become very abundant.

Treating sheep against ticks by dipping or tip spraying is unsatisfactory for several reasons. In the first place, the ticks (nymphal stage) emerge in late winter (August-September) and mustering ewes and lambs in early spring for treatment is not practicable. Secondly, dipping or spraying is effective only for several weeks, reinfestation occurring readily from the pasture as soon as the toxicity of the preparation has worn off.



The smallest ticks are the six-legged larvae which can be on animals literally in thousands. The long-legged, unbloated ticks near the threepence are unfed adults. The two large ones nearest the scale are preserved adults. Fresh specimens would be half as big again. The two adult ticks at middle right and left are fresh specimens taken off stock.

NUMBER 5 IN A SERIES OF LETTERS ADDRESSED TO A SHEEP FARMER'S SON IN NEW ZEALAND

She never put a foot wrong, Tony!

If you were to explore the coastline near the main shipbuilding centres, you would probably come upon a pylon, standing clear and bold above the shore. A bit further along, you would find another, exactly like the first. They mark the Measured Mile, Tony—and they've just played a tidy part in our activities.

'Fremantle Star', fully equipped and ready for sea, has just completed her trials. She passed with flying colours, as we knew she would, but all the same, a trial is a trial. . . .

Down below, the Chief Engineer was watching his future charges with the understanding which comes from long experience and a real love of machinery. But with him in the Engine Room were, amongst others, two strangers—the contractors' engineers; and their attention was firmly fixed on the dials which record engine revs., temperatures and all the other things that together make up engine performance.

On the bridge, with the Captain and Chief Officer were other experts, checking the behaviour of the ship as she was put through her paces. Six runs we made over the Measured Mile—three in each direction; and every single point about her speed and handling qualities was duly checked and noted and recorded. Your ship never put a foot wrong anywhere, Tony.

But that wasn't the end of it. The officials went through 'Fremantle Star' with a fine tooth comb, making sure that everything that was meant to work, *did* work and that every one of the owner's specifications had been properly carried out. And—apart from one or two little things like the bath-tap that didn't run and the door-hinge that was short of a screw—all was well.

Up to now, the ship belonged to the builders. But, with the trials satisfactorily completed, a small ceremony took place in the Captain's cabin at which the ship was officially handed over to her owners. Then the builder's flag was hauled down from the masthead and in its place the house flag of the Blue Star Line fluttered in the wind.

Well, that's the point where my work on 'Fremantle Star' ends—and Alf's begins. So you'll be hearing the rest of the story from him. 'Bye, Tony!

NEW ZEALAND OVERSEAS SHIPPING LINES

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First Trial

The first trial using DDT superphosphate for the control of cattle tick was made under the control of E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne, on a sheep station in the Tolaga Bay area, north-east of Gisborne. About 200 acres was aerially topdressed in August 1957 using 2 cwt per acre of 20 lb para para isomer (ppi) DDT per ton of superphosphate.

Tick counts before treatment showed a heavy infestation of nymphs averaging 35 ticks per square yard. The previous season lambs and ewes were so poor, owing to ticks, that many of the animals could barely walk uphill. After topdressing, ticks could not be found and the success of this first trial can be gauged by the fact that the following year the owners were able to carry 500 ewes and 50 cattle more than could otherwise have been done.

Typical cattle tick country: Rolling to steep consolidated sandhills with rough cover in the South Head, Helensville, area.

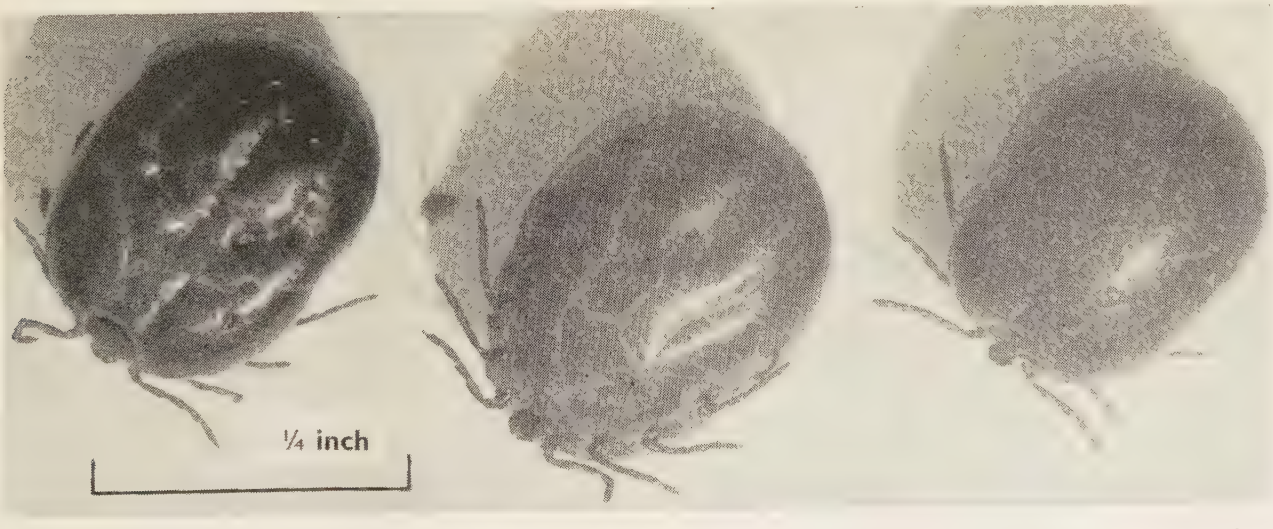
Experience in Northland

In November 1957 a 6-acre block was treated on a farm in the South Head district, north of Helensville, using wet-mix DDT superphosphate at 3 cwt per acre. A 30-acre block alongside was a control. Clean heifer calves were run on both blocks. The calves on the treated block remained free while those on the untreated block collected a few adult ticks. The total infestation was not severe, but the trial proved that while early treatment (as in the Tolaga Bay area) is preferred, adult ticks can still be controlled by treating the pasture as late as December.

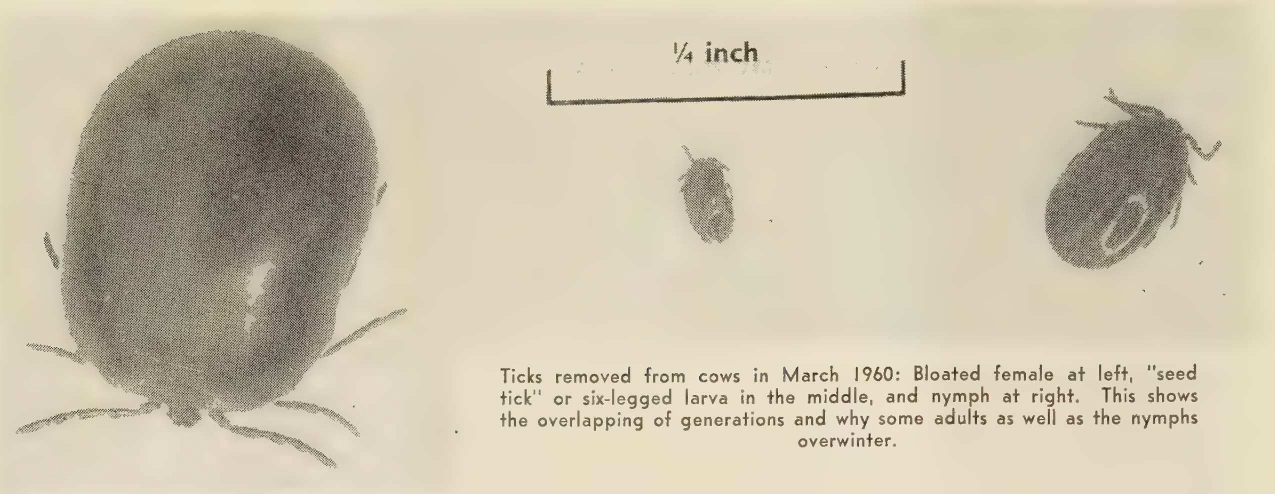
In August 1958 a 40-acre block at Glorit, 20 miles north of Helensville, was treated with wet-mix DDT superphosphate applied from the air at 3 cwt per acre. It had not been possible to control the herbage on this block and it provided excellent cover for a very heavy tick infestation, estimated at over 200 nymphs per square yard. In spite of heavy rain that fell within an hour after the aeroplane had finished, complete control was obtained.

Further information received from this trial in December 1959 (16 months after treatment) showed that the block which received the DDT superphosphate was still relatively free of ticks, whereas the surrounding areas were rapidly becoming worse and the owner was considering treating the remainder of the farm.

On another farm in the South Head district several 1-acre plots were treated with DDT superphosphate to determine the optimal time of application. The DDT superphosphate was applied at 3 cwt per acre (3 lb ppi DDT per acre). One set of plots was topdressed in September, another set in November, and another in December 1958.



Bloated female ticks removed from cows in March 1960. The centre one is on its back to show the eight legs. (The back leg on the left side is against the body.) Individual ticks which drop off stock are considerably larger.



Ticks removed from cows in March 1960: Bloated female at left, "seed tick" or six-legged larva in the middle, and nymph at right. This shows the overlapping of generations and why some adults as well as the nymphs overwinter.

This experiment showed that while animal thrift will improve as a result of the early application, November and December applications will also control the infestation if earlier treatments have not been possible. Pastures treated during all those times remained practically free of ticks for the remainder of the season, as shown by tick counts on the sheep.

The possibility of autumn application is being investigated, as it is realised that if the infestation is severe when the "seed ticks" emerge in late summer, it is unwise to wait six months to remedy the trouble. Also, as many farmers apply their fertilisers in autumn, information is needed on the value of autumn applications of DDT superphosphate for tick control.

Factors Governing Success

That the success of tick control with DDT superphosphate or other similar materials depends on the following factors was brought out by the results of these trials:

$\boxed{1}$ A very uniform cover must be obtained. The success of the control depends on every inch being covered with sufficient DDT to do the job, since once the DDT is washed into the ground it is taken out of reach of the ticks. With aerial topdressing extra precautions must be taken to allow for wind velocity and prevent overlapping and missed strips. This could perhaps be accomplished by sowing at a slightly reduced rate and having the laps closer together.

Spinner topdressers would also have to close up on laps, 24 ft swaths being the maximum which would give adequate cover. Even with farm topdressers it is very easy to miss parts, especially on corners and along fencelines. Close attention to detail will be rewarded by effective control.

$\boxed{2}$ Pasture must be kept under control to prevent surviving ticks from finding suitable cover. Ticks are actually sensitive creatures. Extremes of temperature and either very low humidities or excessive rainfall will adversely affect their spread, which accounts for large variations in tick populations. Without adequate cover they cannot multiply.

$\boxed{3}$ Reinfestation from outside must be prevented. Stock introduced into clean areas must be tick free. Fences must be in good order to prevent tick-infested stock from wandering in. Since fences bordering infested areas are a source of infection, the larger a treated area is, the longer it will remain relatively free of ticks.

$\boxed{4}$ Stock must be kept off a treated area until at least 1 in. of rain has fallen to allow maximum opportunity of contact between ticks and DDT.

Recommendations

Until further work is done with autumn applications of DDT superphosphate for the control of cattle tick it should be applied at 2½ to 3 cwt per acre in late winter or early spring whenever the small ticks are about in large numbers.

If precautions already mentioned are taken, good control of this pest should be obtained. In addition DDT treatment will give protection against grass grub for up to three years. Much of the area subject to cattle tick also suffers from grass grub damage.

Meteorological Records for August

Station	Height of station above M.S.L. (ft)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
				Absolute maximum and minimum					Maximum fall		
		Approx. mean	Difference from normal	Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Amount	Date	
Kerikeri	240	51.4	+ 0.4	65.8	32.8	4.28	21	— 2.55	0.72	4	155
Auckland	160	52.6	+ 0.4	64.8	38.6	2.94	17	— 1.48	0.50	13	173
Tauranga	12	49.4	— 0.3	62.6	32.0	2.09	15	— 2.66	0.48	14	182
Ruakura	131	48.2	— 0.3	65.9	27.3	3.33	15	— 0.76	0.61	15	184
Whakarewarewa	1,006	45.9	+ 0.4	62.5	29.5	2.63	11	— 2.47	0.75	4	140
Gisborne	14	48.8	— 0.4	66.6	31.0	6.47	18	+ 2.61	1.88	18	162
New Plymouth	160	49.8	+ 0.2	65.4	36.4	4.56	16	— 1.19	1.10	14	197
Kariol	2,125	41.2	— 0.8	60.1	23.2	2.51	15	— 1.70	0.61	16	
Napier	5	48.6	— 0.5	66.0	31.9	2.27	13	— 0.66	0.72	17	166
Wanganui	72	47.9	— 1.2	63.1	31.1	2.42	11	— 0.53	1.36	16	181
Palmerston North	110	47.2	— 0.5	64.6	29.2	2.64	13	— 1.11	0.84	15	172
Waingawa	340	45.2	— 0.7	63.6	26.0	2.93	17	— 1.25	0.79	13	152
Wellington	415	47.3	— 0.3	59.0	33.9	4.93	15	+ 0.28	0.98	16	159
Nelson airfield	5	44.0	— 0.8	61.3	27.2	0.75	5	— 2.39	0.25	15	186
Blenheim	14	45.4	— 0.9	64.1	27.0	1.47	8	— 0.86	0.40	5	201
Hokitika	15	46.0	+ 1.3	60.6	27.9	3.33	12	— 5.71	1.05	4	155
Hanmer Forest	1,270	41.6	+ 0.2	65.8	21.0	3.18	10	— 0.40	1.40	16	135
Christchurch	22	44.5	+ 0.2	69.0	25.4	1.25	6	— 0.80	0.50	16	142
Ashburton	323	43.8	+ 0.1	70.2	22.0	2.65	7	+ 0.33	1.59	16	146
Timaru	56	43.8	+ 0.0	62.9	26.6	1.38	8	— 0.08	0.79	17	124
Alexandra	520	42.2	+ 0.8	67.6	20.1	0.70	6	+ 0.07	0.42	4	121
Taieri	80	43.2	— 0.5	70.4	23.4	2.40	11	+ 0.66	0.80	10	105
Invercargill airfield	0	42.7	— 0.3	61.9	26.0	2.73	13	— 0.21	0.99	3	116
Chatham Island	150	46.8	+ 0.6	56.1	32.9	3.70	20	+ 0.53	0.97	6	

Present Lime Transport Assistance Favours Virgin and Hill Country

By C. DURING,
Senior Scientific Officer,
Department of Agriculture,
Wellington

IN the early days of settlement in New Zealand lime was regarded as necessary for successful establishment of pasture on many soils. There were in fact many areas, especially those of high rainfall, on which large dressings of lime were required as one of the first essentials, and it was largely this fact which prompted the Government of the day to introduce free railage on lime up to 100 miles in 1898. This system became outmoded by the growth of road transport and bore unfairly on farmers dependent on long road hauls for their lime supplies.

IN 1947, therefore, a new system, the Lime Transport Assistance Scheme, was introduced and except for minor amendments it remained in force until 30 November 1959. The cost of this recent scheme was shared as follows: Meat Industry Account 70 per cent, Dairy Industry Account 15 per cent, Consolidated Fund 15 per cent. The Dairy Industry Account, nearly exhausted by a fall in overseas receipts, ceased to contribute in 1958. Its share was paid in the meantime from the Consolidated Fund. In 1959 the Meat Producers Board withdrew its support. Since the Government was not prepared to carry the burden of lime transport assistance alone, but was agreeable to make available annually a sum equal to its normal contribution, a limited Lime Transport Assistance Scheme was introduced on 1 December 1959.

Lime is eligible for lime transport assistance under the new scheme only if used on land:

(a) Which to the best of the knowledge of the occupier has never been limed,

(b) Which to all appearances and to the best of the knowledge of the occupier has never been cultivated, and

(c) Which in the opinion of the Department of Agriculture requires lime for the growth of good pastures or crops.

On such land the subsidy is available on lime used as an initial dressing over a period of 12 months whether it is applied in one or several applications.

Need for Lime on Virgin and Hill Country

The modified Lime Transport Assistance Scheme thus applies to virgin and hill land which is in need of lime. There are large areas of this type of land and it is thought desirable that for the benefit of farmers and the country as a whole the maximum use should be made of technical advice on how to use lime for best results.

Much of the lime-deficient hill country has been aerially topdressed for several years with superphosphate and commonly with molybdenum.

While molybdenum and superphosphate can be of great benefit in stimulating clover growth on acid soils on which superphosphate alone is almost without effect, field trials have shown that the addition of lime, sometimes at quite low rates of application, may give further worthwhile improvements of pastures and stock carrying capacity. Aerial application of lime at rates up to 10 cwt per acre can often be definitely payable.

On acid land now under scrub or gorse and which can be cultivated lime is almost always essential for the growth of good pasture. The rate at which it should be applied varies greatly with soil type and there is little doubt that on some soils the use of molybdenum has made possible good pasture growth with rates of lime lower than those needed before molybdenum deficiencies were known to exist. Yet even with molybdenum it is not unusual to find lime requirements of up to 2 tons per acre.

Need for Lime on Developed Land

The fact that no subsidy is paid on freight charges for lime used on land already developed does not mean that the Department has evidence that the regular liming of such land is less important than it used to be. The high rainfall in most districts of New Zealand soon washes lime out of the topsoil. This lime must be replaced.

For example if one ton of lime per acre is needed to reduce the acidity of a soil so that it will grow good pasture, it is not uncommon that this rate of application needs to be repeated after four or five years and in high rainfall areas after three years. It is particularly important to correct soil acidity in the top few inches. As soon as rain has washed lime out of this top layer acidity will increase, the vigour of pasture, lucerne, or other crops will decrease, and more lime is needed.

The loss of lime by leaching is roughly proportional to the amount applied. The loss after an application of 2 tons per acre will be about twice that after an application of 1 ton.

Without adequate liming topdressing with fertiliser such as superphosphate and muriate of potash may be largely wasted.

It is therefore most important to find out what constitutes adequate liming on each soil type on the farm. This information can usually be given by the Farm Advisory Officers of the Department of Agriculture who are assisted by their knowledge of results of field experiments, by their ability to carry out trials if needed, and by a chemical test for soil acidity which is available at a comparatively small charge.

New Superintendent of Horticulture Division at Christchurch

MR J. H. WATT, Horticultural Extension Officer, Department of Agriculture, Christchurch, has been appointed Horticultural Superintendent, Christchurch. Before his transfer to Christchurch last year Mr Watt was Horticultural Extension Officer at Head Office, Wellington.

He joined the Department in 1939 at Christchurch and in 1945 became Orchard Instructor, Alexandra. In 1948 he was transferred to Dunedin and then to Wellington, where in 1950 he became Horticultural Economist. In that year he was awarded a Commonwealth Fund Fellowship to study at Cornell University, U.S.A., from which he gained an M.Sc. degree in 1952. He is the author of Department of Agriculture bulletins on currant, gooseberry, raspberry, and strawberry culture.

Mr Watt.

Early Investigator of Hill Country Topdressing Dies

AN early investigation of the economics of topdressing hill country to arrest its declining fertility was among those carried out by Mr W. J. McCulloch, a former Fields Superintendent of the Department of Agriculture at Palmerston North, who died recently. He was a regular contributor to the "Journal" between 1915 and 1935.

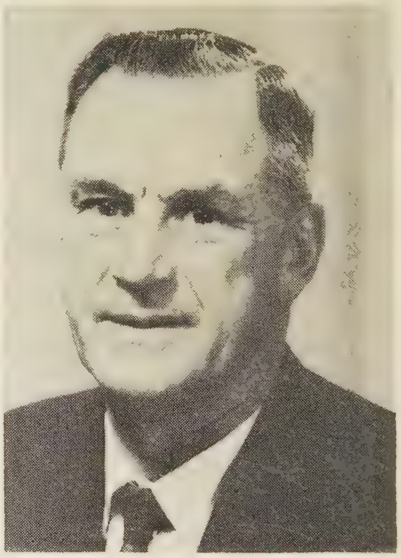
Early in his career Mr McCulloch worked in Otago and Southland, where he was associated with the Gore Experimental Area from its inception. In 1919 he was transferred to the North Island as Manager, Central Development Farm, Weraroa, and in 1924 he was appointed Instructor in Agriculture, Palmerston North.

Mr McCulloch became the first farm manager at Massey Agricultural College in 1927 and was also Lecturer in Sheep Management until he returned to the Department of Agriculture in 1930 as Fields Superintendent, Palmerston North. He retired in 1936.

Mr S. J. Cowen to be Superintendent of Market Milk

MR S. J. COWEN, Market Milk Instructor, Palmerston North, has been appointed Superintendent of Market Milk, Department of Agriculture. He succeeds Mr T. P. J. Twomey, who resigned from the Department recently to join the New Zealand Dairy Products' Marketing Commission.

The holder of a Massey College Diploma in Dairying, Mr Cowen had extensive butter factory experience in New Zealand before accepting the appointment of Manager of the Rewa Dairy Company in Fiji in 1935. In 1938 he joined the Department of Agriculture as Farm Dairy Instructor, Motueka, and a year later became Special Inspector, Hamilton. He was promoted to Dairy Instructor and Grader, Wellington, in 1944, but transferred the same year to Massey College as Acting Superintendent of the College dairy factory.



Mr Cowen.

When the Dairy Division assumed responsibility for the supervision of milk treatment stations in 1946 Mr Cowen was appointed Market Milk Instructor, Palmerston North, with Dominion-wide coverage. For two years, during Mr Twomey's absence overseas on Colombo Plan work, he was Acting Superintendent of Market Milk.

Weed Identification and Control

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.

PENNISETUM MACROURUM

By A. K. BOOTH,
Farm Advisory Officer, Department of Agriculture,
Wanganui

MANY of the worst weeds in New Zealand have been introduced as garden plants, but have escaped to farm lands. Two of the most serious are water hyacinth (*Eichhornia crassipes*) and Cape tulip (*Homeria collina*). Another which has become widespread in recent years and may yet prove equally dangerous and difficult to control is an ornamental grass *Pennisetum macrourum* Trin., a native of South Africa, where it is commonly known in south-western districts as bedding grass.

THE plant grows in clumps from 3 to 6 ft high and has long shiny, green leaves which hang in a dense mat over the ground and smother out the surrounding pasture. It is a prolific seeder and produces a mass of seeds attached directly to the stalk. The seed heads are 6 to 8 in. long and the seed itself is surrounded by an arrowhead formation of bristly hairs which aid its spread by the wind and in the wool and hair of animals. The seedling plants have very strong fibrous roots and in the second season the plants develop strong underground runners which spread out rapidly from the main crown and send up new shoots.

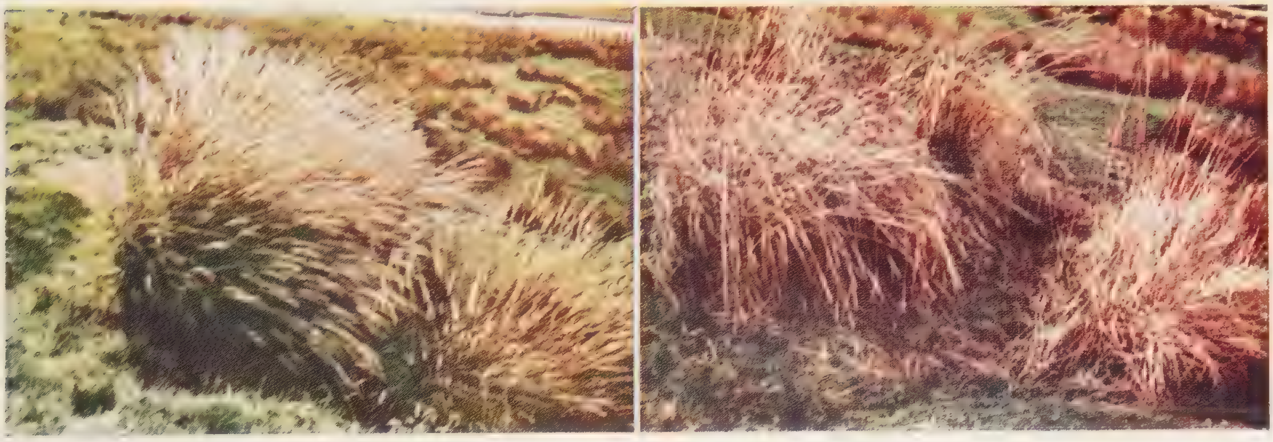
Prefers Damp Conditions

In its native country *Pennisetum macrourum* grows in swamps and streams. In New Zealand it seems to prefer damp conditions, but generally it has not shown any preference for soil or locality. In the Wanganui district it has grown on roadsides and hill faces and in backyards.

A heavy and economically significant area of the plant at Kaikoura has been troublesome for over 20 years. Infestations of varying dimensions are known at Dargaville, Ruawai, Aratapu, Glinkes Gully, Te Kopuru, Waipoua, Epsom, Pipiroa, Rotorua, Opotiki, Mourea, Dannevirke, Hunterville, Kauangaroa, Kairanga, Vernon, Wharanui, Culverden, Omihi, Wairau, Brighton, Lincoln, Westport, Methven-Rakaia, and Clutha River.

Problem of Control

Pennisetum macrourum is a difficult grass to eradicate. Though reported to be eaten by stock in some parts of South Africa, it is relatively unpala-



▼ Left: *Pennisetum macrourum* on a hillside at Hunterville 10 days after spraying. Right: The same plants six months after spraying with heavy rates of monuron and amitrol.

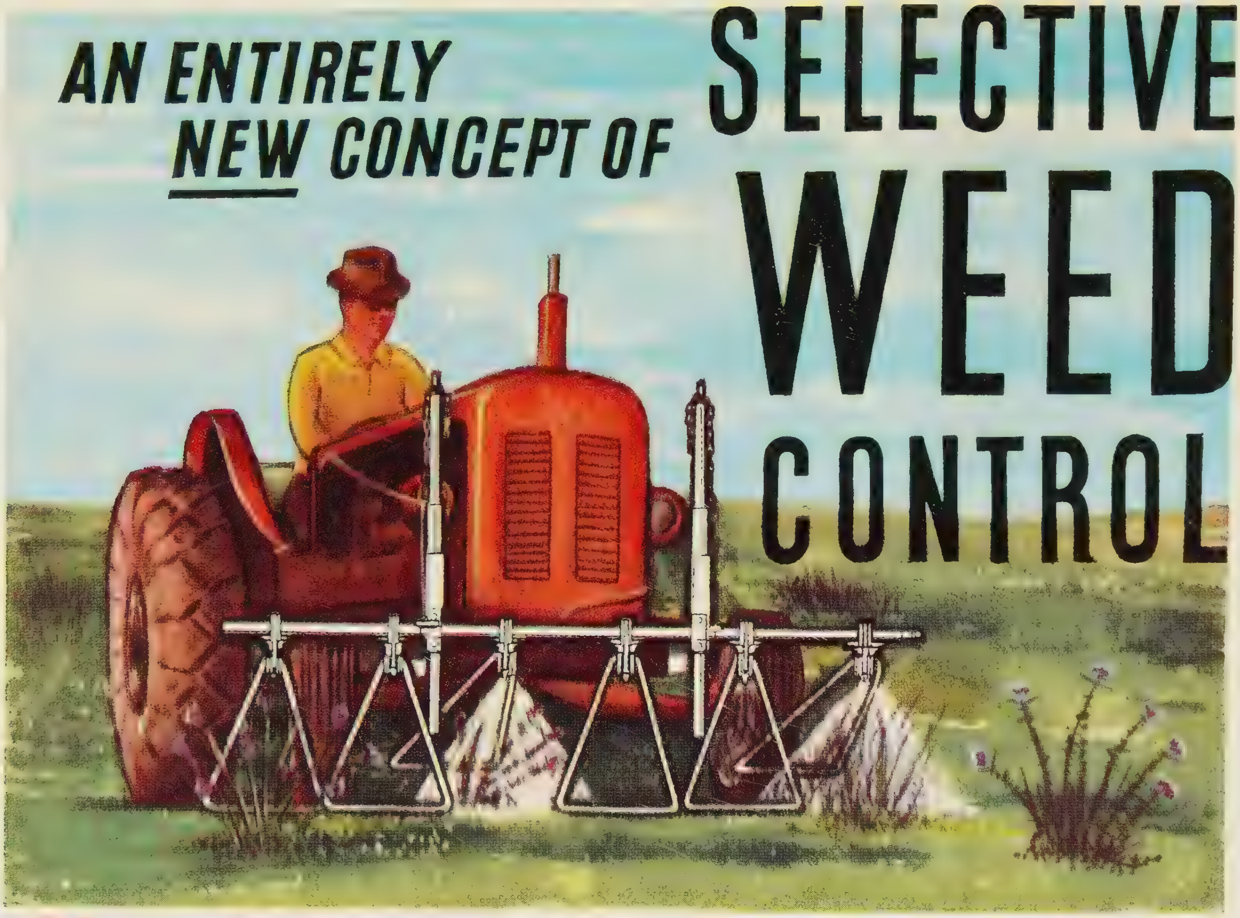


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table to stock in New Zealand and can be partially grazed only by forcing cattle on to it. Its unpalatability rules out any form of control by grazing management. Attempts to grub or dig out the plant have not been successful because of strong regrowth from remaining root particles. Control with chemical sprays has been difficult because of the strong underground rooting system and thick, vigorous top growth, which is difficult to penetrate.

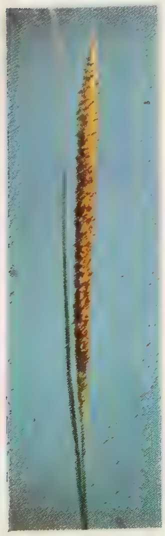
A further problem is that re-establishment by seedlings can be rapid because of the large number of viable seeds lying in the topsoil.

Trials in Rangitikei District

In the spring of 1959 trials were put down in the Kauangaroa and Hunterville districts in an endeavour to obtain a satisfactory chemical method of controlling both mature and seedling establishments. On the established area the following chemicals were used: monuron 10 lb and amitrol 2 lb per acre, monuron 20 lb and amitrol 4 lb per acre, monuron 30 lb and amitrol 6 lb per acre; dalapon 15 lb and amitrol 3 lb per acre, dalapon 30 lb and amitrol 6 lb per acre; dalapon 30 lb per acre; fenac 12 lb per acre. These chemicals were mixed with water and the mixture was applied at 200 to 300 gallons per acre.

On the eight-month-old seedling establishments the treatments were: dalapon 10 lb and amitrol 2 lb per acre, dalapon 20 lb and amitrol 4 lb per acre; monuron 10 lb and amitrol 2 lb per acre. At least 200 gallons of water per acre were required to give a reasonable cover.

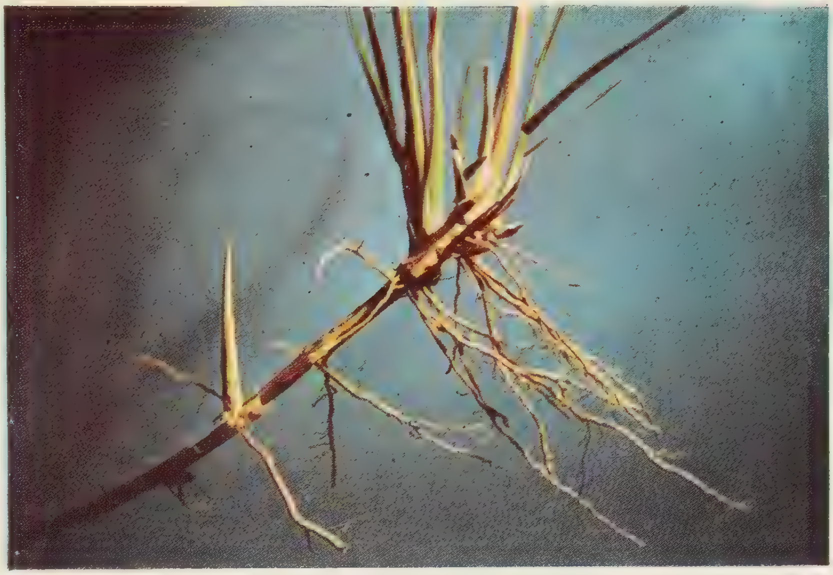
The results were disappointing. The surrounding pasture was killed out and though the number of seed heads formed by the plants treated with dalapon were reduced substantially, there was only a slight browning off of the plant itself.



Seed head of *Pennisetum macrourum*.

Potentially Dangerous Weed

Some decades ago *Pennisetum macrourum* was used in horticulture as a landscaping plant and it is now classified in the first schedule of noxious weeds. While it is not a serious problem in many of the localities where it has been found, it has all the characteristics of a potentially dangerous weed. Once it becomes established over large areas eradication is extremely difficult and the cost of materials prohibitive. Positive action now could save expensive and time-consuming control measures later.



Very strong underground runner which has spread from the main bush and sent out roots and new shoots.

Experimental work has indicated that it can be killed out with heavy rates of monuron at 85 lb per acre with amitrol at 15 lb in 600 gallons of water applied in autumn. A good coverage is most important. The thick leafy growth makes this difficult in inaccessible places and regrowth will come up from parts of the plant left unsprayed.

If the initial spraying is carried out in autumn, any new regrowth from seedlings or regrowth from old plants can be dealt with the following spring. Farmers and others are strongly recommended to watch out for this weed and take prompt measures for control and eradication. The Department is intensifying efforts to find suitable chemical control methods.

Acknowledgments

The author wishes to thank the Botany Division, Department of Scientific and Industrial Research, for a list of known infestations and other information; and the Rangitikei County Council for assistance.

Trials on Control of Sweet Brier

EXPERIMENTS in progress on the control of sweet brier with the oil-soluble concentrated esters of 2,4,5-T indicate that they, compounded with diesel oil, give the most satisfactory results, especially as a basal spray. Further experiments began in the Hakataramea Valley in the spring of 1959 with three new compounds, 2,3,6-TBA, butyl ester of 2,4,5-T, and fenac.

The first of these materials is under trial as a basal, overall, and basal plus overall spray in concentrations of 1 : 40, 1 : 80, 1 : 160, and 1 : 320 in water, and has been applied at 1 pint of material per bush. Results to date show a complete kill of above-ground portions of the plants, with no suckering, but the true effectiveness of this treatment cannot be assessed until this spring. Fenac, like 2,3,6-TBA, seems to have killed the smaller plants, but on some of the larger plants suckering is already apparent. With 2,4,5-T a kill of the aerial portion of the plants is apparent, but greater suckering, up to 10 per cent, is now noticeable on the trial plots. The true effectiveness of these chemicals cannot yet be assessed.

The compound fenuron may be a suitable material for application in solid form for isolated bush control and experiments have begun to find rates of material required for bushes of various sizes.

So far, however, the basal spraying of bushes with 2,4,5-T in diesel oil at the ratio of 1 lb acid equivalent to 20 gallons of diesel oil at the beginning of spring growth appears the most efficient treatment. Repeat applications will probably be necessary.

—*J. G. RICHARDS,*
Farm Advisory Officer,
Department of Agriculture,
Oamaru

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Recent Advances in Investigations

Control of White Muscle Disease and Ill Thrift with Selenium

WALLACEVILLE Animal Research Station workers have been able to demonstrate under carefully controlled conditions that selenium administration can prevent:

- Congenital white muscle disease.
- Barrenness in ewes associated with congenital white muscle disease.
- Some forms of unthriftiness in lambs before weaning and after weaning.

This was stated in a review of recent selenium investigations by W. J. HARTLEY, Pathologist, A. B. GRANT, Principal Scientific Officer, and C. DRAKE, Scientific Officer, all of Wallaceville, at the Massey College sheepfarmers' conference. This article is an adaptation of their address.

White Muscle Disease and Barrenness in Ewes

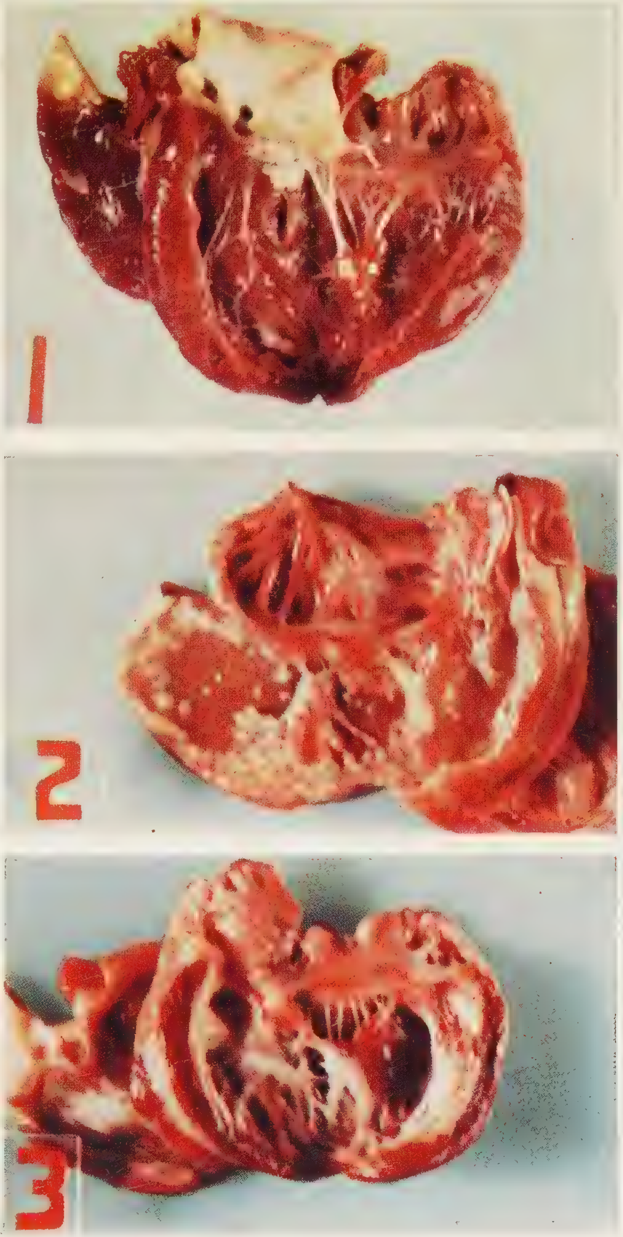
EWES on some properties in West Otago experiencing outbreaks of congenital white muscle disease have very low conception rates. Accordingly lambing results for the 1958 season on 37 farms in Canterbury and Otago were studied and disclosed a close relationship between the presence of congenital white muscle disease and the incidence of barren ewes. Details are given in Table 1.

TABLE 1—CONGENITAL WHITE MUSCLE DISEASE AND EMPTY EWE INCIDENCE

Congenital white muscle disease	Empty ewe incidence Up to 10 per cent	 11 to 30 per cent	 Over 30 per cent
Present (21 farms)	3	8	10
Absent (16 farms)	12	4	0

During the 1959 season we carried out detailed trials with ewes on eight properties in Otago and on three in the Rotorua-Taupo area all of which had had low lambing percentages and white muscle disease the previous season. In the North Island trials all the ewes on the property were divided up into age groups, half of each age group being given selenium and the other half (controls) being undosed. In the South Island trials, mobs of from 100 to 500 ewes were given selenium and similar numbers were kept as controls. All trial ewes on each property were run together from before mating until just before lambing, when the two groups were separated, the selenium-dosed ewes lambing separately from the controls.

The selenium-dosed ewes received 5 mg of selenium at monthly intervals from one month before tupping until just before lambing; half of the rams were also given selenium at monthly intervals before and during tupping. All lambs born dead or dying in these trials were subjected to a detailed post-mortem examination, particularly for white muscle disease.



Lesions of white muscle disease affecting the heart. 1—Mild. 2—Moderate. 3—Severe.

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In the three trials carried out in the Rotorua-Taupo area selenium-dosed groups on all properties had a considerably higher lambing percentage and far fewer barren ewes than did the controls. Further, there were no cases of congenital white muscle disease in the lambs of selenium-dosed ewes.

TABLE 2—LAMBING DATA IN ROTORUA-TAUPO TRIALS

Property	Lambing percentages		Empty ewe percentage		White muscle disease incidence	
	Control	Se	Control	Se	Control	Se
C	60.6	94.9	31.1	7.5	37.5	0
D	55.0	86.0	24.3	11.5	22.2	0
E	70.5	93.6	26.1	6.4	12.0	0

On four of the eight trial farms in Otago the lambing percentage increased markedly in the selenium-dosed ewes (see Table 3). Once again selenium prevented the development of congenital white muscle disease.

The initial trials indicate clearly that selenium administration can be very beneficial in some cases of ewe infertility, but it is most important to realise that increased fertility can be expected only where there is a past history of the congenital and, possibly also, the delayed form of white muscle disease and a concomitant high incidence of barren ewes. It seems most unlikely that selenium will raise the lambing percentage of flocks where it is regularly 100 per cent or more.

TABLE 3—LAMBING DATA IN OTAGO TRIALS

District	Lambing percentage		Empty ewe percentage		White muscle disease percentage	
	Control	Se	Control	Se	Control	Se
Moa Flat ..	104.9	106.0	5.0	2.5	0	0
Dumbarton ..	108.0	120.0	5.1	3.7	0	0
Hakataramea ..	90.8	89.8	N.A.	N.A.	1.6	0
Arrowtown ..	110.0	117.0	9.0	5.0	70.0	0
Crown Terrace ..	85.1	97.2	5.0	3.0	10.5	0
Cromwell (M) ..	119.0	121.0	3.0	1.0	0	0
Cromwell (L) ..	42.0	86.0	27.0	12.5	5.0	0
Cromwell (H) ..	82.0	103.0	N.A.	N.A.	0	0

Administration of Selenium

Monthly administration of selenium, as done in our initial trials, is impracticable under New Zealand sheepfarming conditions. We are at present carrying out detailed trials with ewes on the pumice soils in the Rotorua-Taupo area to devise more workable methods of administering selenium.

Some interesting data resulted from uncontrolled farmer-conducted trials in the Wairakei area during the 1959 lambing season. On one recently settled Department of Lands and Survey block six of the 15 settlers gave one dose of 5 mg of selenium to half their ewes before tupping, one farmer gave all his ewes 2½ mg, and seven gave no selenium. Table 4 gives the lambing percentages for these properties and includes the data for our trial property. These figures strongly suggest that one dose of selenium given before tupping may overcome barrenness in ewes. However, it may not prevent congenital white muscle disease.

TABLE 4—LAMBING PERCENTAGES ON ORUANUI BLOCK, WAIRAKEI

Number of properties	No Se	Pre-tupping ewe treatment 5 mg Se to half ewes	5 mg Se to all ewes	2½ mg Se to all ewes
7	52.2 (55.0—74.0)			
6		72.4 (61.5—77.0)		
1				85.7
Trial farm	55.0		86.0	

Unthriftiness in Lambs

The dramatic effect of selenium in controlling lamb unthriftiness and mortality on the pumice soils in the centre of the North Island and in increasing growth rate in lambs in Canterbury is already known. During the 1958-59 season we carried out 30 trials with selenium on unthrifty weaned lambs in the North Island, and in 22 trials there was a statistically significant growth response.

This year officers of the Department of Agriculture are making a Dominion-wide survey to investigate the effect of selenium and cobalt, separately and combined, on increasing the growth rate of both thrifty and unthrifty lambs. No results are yet available.

The dose rate of selenium in our 1958-59 trials was 5 mg of selenium given by mouth at monthly intervals. During the past season we have carried out detailed dose rate trials in unweaned and weaned lambs on two problem properties in the North Island, one at Bulls on sand country and the other on pumice at Taupo. We gave lambs varying doses of selenium both by mouth and by subcutaneous injection at varying intervals.

Preliminary results for this season, in which unthriftiness has not been as serious as in some seasons, suggest that dose levels considerably below those previously used and given at longer intervals will produce a satisfactory growth response in unthrifty lambs. Higher dose levels and more frequent dosage did give a slightly better response. There was no appreciable difference in the response to selenium given by mouth or by injection.

Other Methods of SE Administration

As minute amounts of selenium are required by the animal, individual dosing appears to be the most logical method of selenium administration and at the moment is the only one that can be recommended.

We believe that at this stage selenium should **not** be incorporated in fertilisers, feedstuffs, or licks. Such methods of administration would undoubtedly supply more selenium than the animal needs. If selenium is to be widely used in this country for the prevention, control, and treatment of white muscle disease and unthriftiness in lambs, it is imperative that animals be given not more than the smallest dose required.

◆

Suggestions for Selenium Administration

THE following selenium doses for sheep are suggestions based on trials carried out on North Island sand and pumice soils. They are not general recommendations, either for all soil types or for all seasons. (The selenium should be given by mouth.)

Barren Ewes and Associated Congenital White Muscle Disease

Ewes: 5 mg of selenium one month before tupping; 5 mg two months later; and 5 mg a month before lambing starts.

Rams: 5 mg of selenium one month before tupping.

Congenital and/or Delayed White Muscle Disease

Ewes: 5 mg of selenium one month before lambing starts.

Lambs: 1 mg of selenium at docking.

Unthriftiness in Lambs

Lamb unthriftiness responsive to selenium has been encountered mainly on the lighter soils (pumice, sand, silt, or shingle). A selenium trial is advisable on any farm on these soils where pre-weaning or post-weaning unthriftiness occurs, particularly in seasons of lush summer pasture growth.

The suggested dose is: 1 mg of selenium at weaning (or before, if unthriftiness appears) followed by 1 mg at two- or three-monthly intervals or as soon as lambs appear to be slipping.

Selenium is **not** the answer to all forms of unthriftiness in lambs. It does not appear to have any beneficial effect on lambs affected by the autumn-flush ill thrift which is so common.

Constructing a Farm Dam

By J. L. DOUTRE,
Farm Machinery Instructor,
Department of Agriculture,
Auckland

THE impounding of water is governed by Drainage Acts and catchment boards, so permission should first be sought if construction of a farm pond is contemplated. Provision for the safety of life and property below the site should the structure fail should also be considered.

THE site selected for a dam should be near available power for pumping and central to the water supply system. It may be possible to find a site higher than the troughs and reticulate some if not all the farm by gravity, thus reducing pumping costs. Large catchments should be avoided and the soil type must be suitable for holding water. Gentle slopes provide the largest ponding areas for the least earth work. The pond should be large enough to provide adequate water for all livestock during long dry spells with a safe margin for both evaporation and ground seepage.

Earth work consists of building the dam and forming a spillway. First a good key or gullet should be excavated across the dam site and all topsoil removed to provide good bonding of the dam into the clay sub-base. The topsoil should be piled below the dam site so that it can later be placed over the completed dam for quickly grassing over. Moist, impermeable clay should then be excavated from above or inside the pond area and layers of less than 6 in. thickness placed through the gullet and consolidated to form the solid core of the dam. A wheel tractor following the bulldozer or carryall will further assist compaction of the centre core.

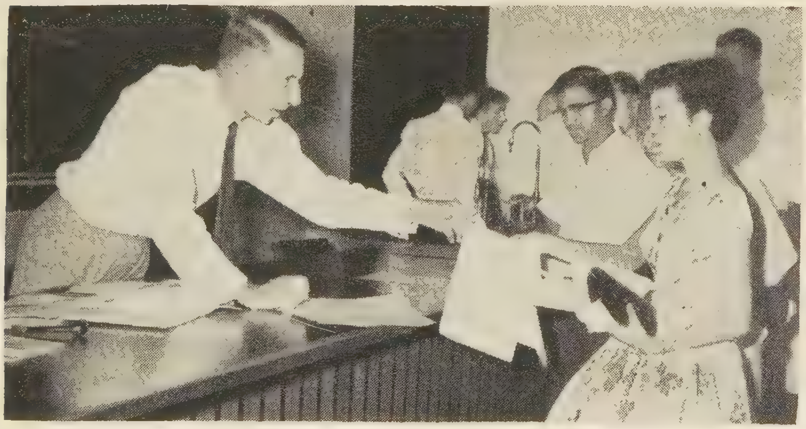
Slope of Dam

The slope of the dam inside the pond should be 1 : 2½ or 1 : 3 for larger dams. The outside slope should be at least 1 : 2. Since the dam will settle further during the first season, the crest should be built up about an extra 15 per cent at the centre (1½ ft for a 10 ft dam) to prevent overtopping after complete settlement, at least 3 ft of freeboard always being allowed above the spillway.

Adequate bypass must be provided on a gentle gradient to carry all excess water clear of the dam toe. Often the spillway can be diverted over a ridge and into another gully. The spillway should be wide and have a flat base to reduce flow rate and consequent erosion. On very large catchments the bypass may constitute a greater construction work than the dam itself. Most dam failures are due to inadequate provision for bypass.

Where the watershed is covered in trees or bush the rate of run-off and water concentration at the dam will be slow. If the area is later cleared and put into grass, greater bypass capacity must be provided to accommodate the increased rate of run-off.

New Malayan Agricultural College

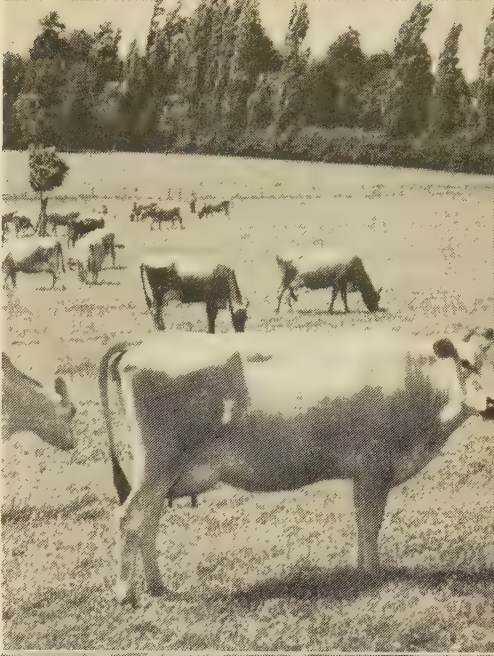


[*National Publicity*

THE building housing the new Faculty of Agriculture of the University of Malaya, built with a £250,000 Colombo Plan grant by New Zealand, was opened by the Prime Minister, Mr W. Nash, recently. The illustration above shows the New Zealand head of the faculty, Professor G. Maxwell Davies, enrolling Miss Loh Yoke Oi, 21, of Singapore, the only woman among the second-year students in the college.

United Kingdom Market for New Zealand Butter

By J. B. QUIGG,
Investigating Officer, Department of Agriculture, Wellington



BUTTER is the principal product of the New Zealand dairy industry and one of our main exports. Butter, therefore, not only provides the New Zealand dairy farmer with a substantial part of his income, but makes an important contribution to the country's total earnings of overseas exchange. These overseas funds are the foundation on which our economic superstructure rests. Most of the butter exported by New Zealand goes to the United Kingdom and its price on this market largely determines the level of overseas earnings from this commodity.

THE factors which influence butter prices in the United Kingdom and the desirability of New Zealand reducing, in so far as this is possible, her extreme dependence on this market as an outlet for her butter exports will be discussed.

N.Z. Production and Trade in Butter

During the season ended 30 June 1959 total milk production in New Zealand was estimated at about 1,162 million gallons. The manner in which this quantity was utilised is shown in Table 1.

TABLE I—MILK PRODUCTION AND UTILISATION IN NEW ZEALAND

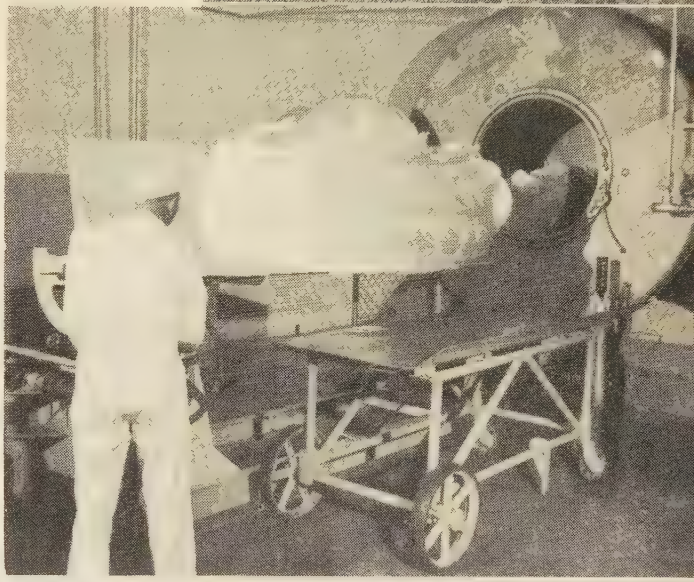
	Million gallons	Per cent of total
Used by dairy factories in manufacture of:		
Butter	849	73.1
Cheese	164	14.1
Other whole milk products	14	1.2
Used for human consumption as milk, cream, or ice cream	109	9.4
Used on farms and wastage	26	2.2
	1,162	100.0

Source: New Zealand Dairy Board.

Table 1 demonstrates the importance of the manufacturing side of the dairy industry, particularly the making of butter.

Though New Zealand has the highest per capita consumption of butter (43 lb) in the world, her population is far too small to consume more than a small proportion of total annual output. For instance, for the 1958-59 season butter production amounted to 221,600 tons, of which only 44,700 tons were disposed of on the domestic market.

The United Kingdom has always been New Zealand's main export market for butter. The importance of this market was given added emphasis under the bulk purchase agreements between the United Kingdom and New Zealand which were in



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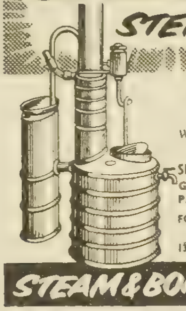

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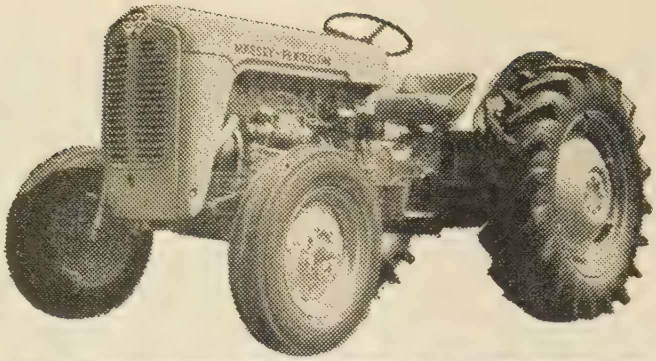

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force throughout the war and immediately after. Under these agreements our entire output of butter, with minor exceptions, was pledged to the United Kingdom. These agreements expired at the end of the 1953-54 season, and though strenuous efforts have been made since then by the dairy industry, with the assistance of Government, to expand and develop markets in other parts of the world, the United Kingdom remains the buyer of the overwhelming proportion of our production. Table 2 gives export figures for recent years.

TABLE 2—EXPORTS OF BUTTER FROM NEW ZEALAND

	Destination		
Season	U.K.	Other countries	Total
	tons 000's	tons 000's	tons 000's
1954-55 ..	124.0	25.2	149.2
1955-56 ..	139.2	23.6	162.8
1956-57 ..	142.9	12.0	154.9
1957-58 ..	167.5	8.5	176.0
1958-59 ..	161.6	12.1	173.7

Source: New Zealand Dairy Board.

In 1959 the sale of butter abroad earned £60.4 million in overseas exchange (£55.1 million from United Kingdom sales). This amount represented 20 per cent of total export receipts of £305.9 million. Thus not only dairy farmers but all New Zealanders have an important interest in the state of the United Kingdom butter market.

World Butter Situation

Any appraisal of the United Kingdom butter market requires first some examination of the situation throughout the world. This is so because the United Kingdom is the only substantial "free" market in the world for this commodity, and the greater part of production in excess of domestic requirements in other countries is channelled to that market.

Many factors influence world demand for, and supply of, butter. Perhaps the most important affecting demand are population, the rate of population growth, and the level of incomes and prices in the various countries. Demand is greatest in countries where a high level of income is associated with a developed dairy industry. At the other extreme there are many underdeveloped countries in Asia and Africa whose incomes are so low that butter is far too expensive for most of their people.

Increases in incomes will not necessarily produce corresponding increases in demand for butter. Consumption is already fairly high in some of the more developed countries and increase in demand will depend largely on the relative prices of butter and the most important butter substitute, margarine.

On the other hand, though economic development in the underdeveloped countries must eventually stimulate demand for butter, it has to be recognised that in some of these countries incomes are so low that no demand will arise until development has proceeded for some years and more urgent food priorities have been met.

Another important factor in the demand for butter is dietary patterns. Food habits usually change slowly and are difficult to influence directly. Fortuitous circumstances may, however, accelerate trends, and it is apparent that the disorganisation of marketing channels during the Second World War stimulated the demand for margarine at the expense of butter.

The most important factor influencing butter supplies from the longer-term point of view is changes in the basic structure of national dairy industries and the extent to which scientific advances in farming and in the care and handling of livestock are adopted in various countries. In many countries dairying is conducted on a very small scale and often in conjunction with other farming.

Dairy farms in New Zealand and in North America are much larger than those in western Europe, where holdings are not only small but fragmented. There is therefore considerable scope for increases in supply from structural changes in these latter countries. Changes of this nature increase the practicability of using milking machines, mechanical farm equipment, bulk collection of milk, and factory separation, all of which are aids to greater output.

Over the short period the production of milk and, therefore, the amount used in the manufacture of butter are influenced materially by the weather.

Protectionism

The demand-supply factors already discussed may be termed "normal market" factors. In addition to these the world butter situation is strongly influenced by what might be called "institutional" factors. In the broadest of terms these arise from the desire of governments to protect their farmers from the many influences that tend to make farming somewhat more hazardous than most other occupations and to ensure that their farmers get an income comparable with those in other industries.

This is not the place to discuss the arguments for and against policies of support for agriculture, but it is relevant to say that most of the countries which are large producers and consumers of milk and dairy products have extensive arrangements for supporting the prices of these products, and their domestic markets are protected against competition from imports as an integral part of these policies. The practical effects with butter of national policies of agricultural protectionism are:

1. Stimulation of production through high producer prices.
2. Retardation of consumption through high consumer prices.
3. Channelling of increased quantities of butter to the United Kingdom market, which is not subject to rigid control of imports.

The importance of this last point can best be illustrated by a few statistics. In 1958 the total production of butter by 30 of the main producing countries amounted to 3.9 million tons. In the same year world exports by 20 of the leading exporters amounted to about 550,000 tons. That is, only about 14 per cent of world production entered into international trade. Of this quantity 410,000 tons (75 per cent) came on to the United Kingdom market. These figures make it abundantly clear that relatively small changes in demand-supply relationships in individual countries can have a most disturbing effect on the United Kingdom market.

United Kingdom Market

Butter prices on the United Kingdom market are notoriously unstable. Table 3 gives movements in the London wholesale price of finest New Zealand butter during recent years.

TABLE 3—LONDON WHOLESALE PRICE OF NEW ZEALAND BUTTER

End of last week in	Per cwt finest s.
1957:	
March	250
June	330
September	310
December	260
1958:	
March	230
June	215
September	235
December	290
1959:	
March	290
June	336
September	392
December	410
1960:	
March	290
7 July	310

Source: Abstract of Statistics.

The fluctuations shown in Table 3 are understandable in the light of the broad demand-supply factors discussed. The reasons for the fluctuations become clearer if the factors influencing more specifically the present United Kingdom market itself are looked at more closely. Some of these factors are:

1. Affecting Demand

(a) The slow rate of population growth in the United Kingdom. Between 1949 and 1959 the rate of increase was a little more than 3 per cent; our own population increased by nearly 25 per cent over this period.

(b) The per capita consumption of butter in the United Kingdom has been increasing only slowly and, in fact, fell last year to 18.5 lb from 20.2 lb

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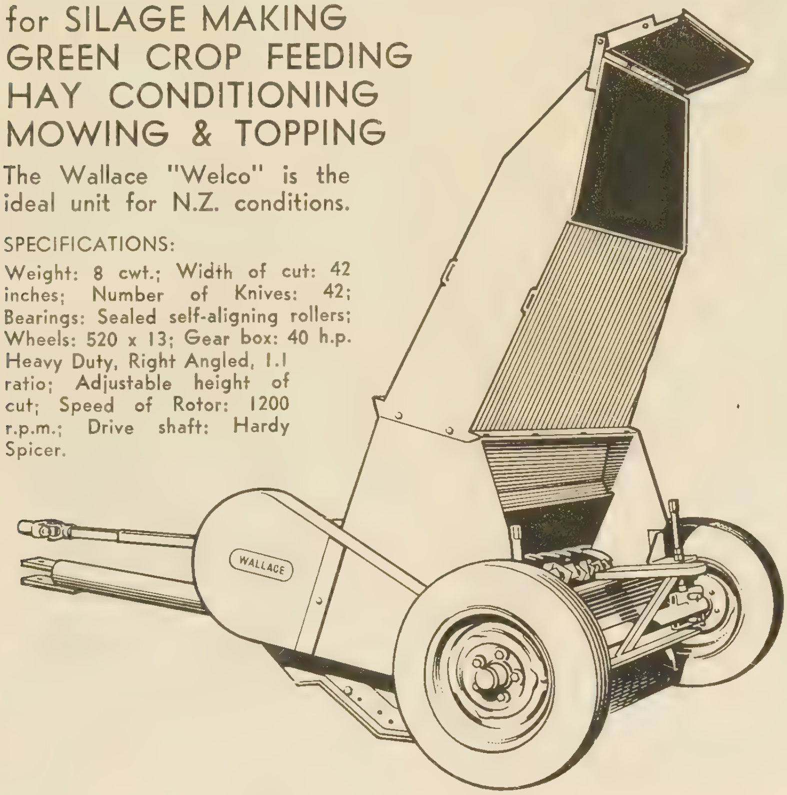

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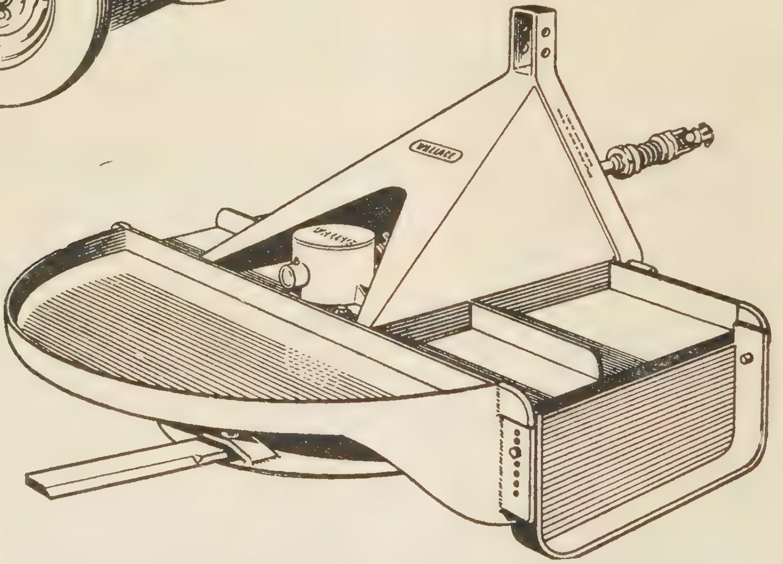

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in the previous year. The pre-war level of consumption was about 24 lb per head. On the other hand the per capita consumption of margarine in 1959 was 15 lb compared with 10 lb before the war.

2. Affecting Supply

(a) Milk production in the United Kingdom has been increasing steadily. Average annual production during the three years 1957-59 was 2,137 million gallons compared with 1,829 million gallons during 1950-52.

(b) In the early 1950s the United Kingdom's average annual production of butter was about 10,000 tons; present butter production is likely to exceed 30,000 tons.

(c) Until recent years the only substantial exporters of butter to the United Kingdom were New Zealand, Denmark, Australia, and, to a much less extent, the Netherlands. In 1958 and 1959 imports from other than the countries just mentioned amounted to 78,000 and 66,000 tons respectively.

Table 4 shows that the quantities of butter manufactured in the United Kingdom and the amounts imported from each supplying country fluctuate markedly from year to year.

TABLE 4—BUTTER ON UNITED KINGDOM MARKET

	1957 tons 000's	1958 tons 000's	1959 tons 000's
Stocks at beginning of year (2 or 4 January) ..	43.3	42.0	31.7
Domestic production	34.0	29.7	14.4
Imports from:			
Australia ..	53.4	49.8	64.1
New Zealand ..	146.2	170.0	162.6
Denmark	87.0	95.3	94.6
Netherlands ..	12.6	29.7	13.5
Canada	—	—	6.0
Irish Republic ..	14.9	16.2	0.9
Argentina ..	12.3	4.7	14.2
Austria	1.2	4.5	2.9
Finland	20.2	13.6	11.9
France	0.8	2.7	1.4
Norway	0.3	2.1	3.0
Poland	0.9	15 8	16.7
Sweden	14.0	11.8	—
U.S.A.	—	—	5.2
Other	1.5	6.5	3.8
	365.3	422.7	400.8
	442.6	494.4	446.9
Less exports ..	4.3	4.5	2.5
Stock at end of year (25 or 27 December)	35.5	31.3	10.6
	39.8	35.8	13.1
	402.8	458.6	433.8

Source: Commonwealth Economic Committee.

Though the annual fluctuations shown above may not be quantitatively large for any one country, cumulatively they often amount to a considerable quantity of butter. As the United Kingdom is the only substantial free market for butter exports, the quantities produced which are surplus to the domestic requirements of a large number of countries find their way there and the price of butter moves to a level which ensures that the total supply available passes into consumption.

New Zealand has no quarrel with the general principle of letting the free play of market forces determine prices. What we object to strongly, however, is the fact that much of the butter coming on the United Kingdom market (including the quantity produced domestically) is subsidised production. This point is made in passing only, and it is not the purpose of this article to develop it further.

Influence of Margarine

Brief reference has already been made to the importance of the substitute margarine on butter sales. Table 5 gives the estimated consumption per head of butter and margarine in the United Kingdom during recent years and before the Second World War.

TABLE 5—CONSUMPTION OF BUTTER AND MARGARINE IN UNITED KINGDOM

	lb per head	
	Butter	Margarine
1938	24.1	10.0
1956	15.6	16.9
1957	17.5	15.1
1958	20.2	13.4
1959	18.5	15.0

Source: Commonwealth Economic Committee.

Prices for margarine do not usually fluctuate much, partly because of the possibilities of substituting one oil for another in its production according to the prices of various oils at any time. Standard brands of margarine retail in the United Kingdom at about 1s. 9d. per pound compared with about 3s. per pound and more for butter.

However, margarine consumption is not so much influenced by its own price as by the price of butter. Thus in 1959 the fall in butter consumption, which was brought about by reduced supplies and higher prices, was accompanied by an increase in the offtake of margarine from the market. The inter-relationship of the price of butter on the one hand and the quantities of butter and margarine absorbed in the United Kingdom market on the other is demonstrated in Table 6.

The availability of the cheap substitute margarine is therefore one of the important factors contributing to the complexity of the United Kingdom butter market. In some respects the competition between butter and margarine for a share of the consumers' expenditure on edible fats is a stabilising influence in the butter market in that when butter is scarce and prices are rising consumers tend to increase their consumption of margarine and this helps to damp down the rise in butter prices. Likewise, when butter is plentiful and prices are falling consumption is diverted from margarine to butter and prices remain higher than they would otherwise have been.

In the long run, however, the existence of the substitute margarine has a general depressive effect on United Kingdom butter prices.

Conclusion

Even the relatively brief survey given shows that the price of New Zealand butter in the United Kingdom is determined by a complex array of factors. The price fluctuates widely and as recently as in the latter half of last year the return from the market was very favourable compared with the price at the time of writing (July).

Irrespective of the effects of adverse seasonal conditions, it would appear that there are a number of influences at work which suggest that supplies to the market might be tending to outrun demand. Whether or not this is the situation, it is quite clear that the New Zealand economy, and the dairy industry particularly, depend to an unhealthy extent on the United Kingdom market as an outlet for the overwhelming proportion of our production of butter. New Zealand's vulnerability in this respect has been recognised by both the Government and the dairy industry for some considerable time and strenuous efforts are being directed toward appropriate remedial action.

TABLE 6—ESTIMATED DISAPPEARANCE OF BUTTER AND MARGARINE IN U.K. AND PRICE OF N.Z. PRODUCT

	Disappearance per week		
	Butter tons 000's	Margarine tons 000's	Total tons 000's
1958:			
January-March	7.57	6.82	14.39
April-June	9.79	6.09	15.88
July-September	9.23	5.58	14.81
October-December ..	8.84	6.60	15.44
Annual average	8.86	6.27	15.13
1959:			
January-March	8.08	6.41	14.49
April-June	9.25	6.64	15.89
July-September	7.95	6.30	14.25
October-December ..	7.62	7.87	15.49
Annual average	8.21	6.83	15.04
1960, January-March ..	7.27	7.02	14.29

London wholesale price of New Zealand butter End of last week in	Per cwt. s.
1958:	
March	230
June	215
September ..	235
December ..	290
1959:	
March	290
June	336
September ..	392
December ..	410
1960, March ..	290

Sources: Commonwealth Economic Committee; Abstract of Statistics.

◆

Care of Livestock during November

By the Animal Research Division

DRY EWES

If dry ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them, and during shearing they should be inspected carefully for udder abnormalities. All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled.

Dry ewes which are retained should not be allowed to get too fat during the summer. If kept in good store condition, they are more likely to hold when mated next autumn.

CONTROL OF FAT LAMB PASTURE

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs even in small paddocks.

SHEARING PREPARATIONS

Preparations for shearing should be made now. Attend to sheepyards and scrub out the woolshed. This will reduce trouble from such diseases as blood poisoning, tetanus, and caseous lymphadenitis (lympho) after shearing. Check over all machinery to see that all parts are in good working order. Dag all dirty sheep and shear hoggets, wethers, dry ewes, and rams. When culling sheep before shearing pay particular attention to teeth, udder, and dropped belly. On fat lamb farms ewes are best shorn after one or two drafts of lambs are away.

HYDATID CONTROL

The safe disposal of sheep offal for the control of hydatid infection is especially important during shearing time. At this time of the year there are extra dogs which require extra feeding, and the aged sheep used for this purpose are most likely to harbour cysts. During this busy period extra vigilance is necessary to see that offal is dealt with safely.

EWE MANAGEMENT

Where early weaning of lambs is practised this can be done at shearing time late this month. If lambs were not vaccinated against scabby mouth at docking, this can be carried out at shearing and weaning.

Where special paddocks have not been set aside for early-weaned lambs and when feed is in short supply, a worthwhile result may be achieved by removing the ewes and leaving the lambs in the paddocks. When feed is scarce this removal of ewe competition for available feed more than offsets the loss of the small supplement of milk.

On hill country early-weaned ewes can be mob grazed to assist in the control of bracken.

DIP RAMS EARLY

Rams should be dipped before they begin to flush, preferably before Christmas; flushed rams sometimes scald after dipping.

CARE OF PIGS

Dry sows should have access to good pasture and in addition should receive from 2 to 4 gallons of milk per day, depending on their condition. They should be kept thriving, but should not be allowed to become too fat. Keep only as many of the spring litters for baconers as can be fed adequately and sell the remainder as porkers.

VACCINATION AGAINST CONTAGIOUS ABORTION

Vaccination has greatly reduced the rate of abortion in dairy cows. There are, however, still too many dairy farmers who do not vaccinate their calves. Past freedom from abortion is no excuse for not vaccinating, as infection may be introduced into a herd at any time. Though vaccination does not begin until January or February, applications should be made now, as veterinarians and Livestock Instructors have to plan their vaccination itineraries. Late applications make this planning difficult. Calves should not be vaccinated until they are over four months. Poor immunity results if they are vaccinated before this. Bull calves should not be vaccinated.

Beef cows are just as susceptible to contagious abortion as dairy cows. By vaccinating heifers before mating many farmers have been able to increase the calving percentage of their beef cows very considerably.

GRAZING MANAGEMENT OF DAIRY PASTURES

During the season of maximum grass growth the problem is to control pastures at their most leafy, nutritious stage. This is best achieved by conserving as silage and hay all growth surplus to requirements. Later on in the season it is important to maintain sufficient pasture cover to ensure growth during the dry summer period. As grass growth declines, gradually increase the periods which paddocks are spelled between grazings and feed out as much silage as the cows will clean up.

Seasonal Notes

By Farm Advisory Division

BUILD SILAGE STACKS WITH SUFFICIENT WIDTH

FARMERS who put silage into wedges with a buckrake and depend on the tractor for consolidation often build stacks too narrow. This means that as the stack rises the tractor has to stay in the one track and cannot get out of its own wheelmarks to consolidate the sides. Poor consolidation increases waste at the sides. Narrow stacks open up with 1 to 2 ft of waste on each side, two bands of well made silage in the wheelmarks (practically no waste), and an unconsolidated strip between the tracks where the rain has got in.

If you want to make silage with the buckrake so that the tractor consolidates the stack while you build, start with a width at least three times that of the tractor and keep the sides vertical until you get well up. This gives the driver room to manoeuvre and to consolidate the edges with the front wheels. The back wheels cannot be used to roll the edges on very narrow stacks, and the sides have therefore to be tramped. Because tramping is rather exhausting, consolidation is more likely to be done properly if it is done with the tractor.

—*M. G. BOYER, Te Awamutu*

* * *

WEED CONTROL IN PEAS

BECAUSE cropping land generally contains a high weed seed population in the soil, and because peas, especially garden varieties, are not a very competitive crop, some form of post-emergence weed control is usually practised. Peas grown for processing often require even closer attention to weed control than do seed peas. This is not due simply to the need for a weed-free crop at harvest, but is a result of efforts to secure a succession of crops at a suitable stage of maturity for processing. To do this, sowing may have to be done when conditions are not ideal and increased competition from weeds can result.

Weed competition in the early stages of growth of the pea crop may affect yield severely, so the aim should be to remove this competition as soon as possible.

Harrowing peas as a means of weed control was common practice, but has now been superseded by spraying with either a hormone or phenol preparation. The two materials differ markedly in their action. The hormone MCPB is a systemic weedkiller, that is, it is translocated within the plant, and is therefore suitable for use on perennial weeds such as Californian thistle. MCPB also controls many annual weeds of pea crops, but not all, and this is a limiting factor in its use. On the other hand, the stage of growth of the weeds, the weather, and the quantity of water used in spraying are not critical with MCPB.

By contrast, the phenol derivative dinoseb (DNBP) is a contact weedkiller and destroys only the parts of plants with which it comes into contact. It is therefore unsuitable for perennial weeds, but it does control a wide range of annual weeds. To be successful, however, dinoseb must be used when the weeds are very young and the temperature suitable. To maintain a margin of selectivity between the weeds and the crop a higher rate of water is required than with MCPB. Dinoseb is poisonous and is a vivid dye, so is more unpleasant to use than MCPB.

At present about half the acreage of peas sprayed is treated with MCPB and half with dinoseb. Where very young susceptible annual weeds are present and can be sprayed in suitable weather, control with dinoseb is satisfactory and often quite spectacular. If a perennial weed susceptible to hormones is present or if annual weeds have passed the stage of growth for control with dinoseb, MCPB must be used.

Varieties of peas differ to some extent in their tolerance to MCPB, early varieties such as William Massey being more susceptible. Nevertheless all varieties, including field peas, will tolerate MCPB at up to 1½ lb acid equivalent per acre. Spraying with this material should be done as soon as possible after the crop has developed four nodes and certainly before flowering begins.

Wild turnip is not well controlled by MCPB and where this weed is a problem a mixture of 1 lb acid equivalent of MCPB and ¼ lb acid equivalent of MCPA per acre should be used. Peas will tolerate low rates of MCPA, and before the advent of MCPB, spraying peas with up to ½ lb acid equivalent of MCPA per acre was not uncommon. However, the addition of MCPA is rather risky on early varieties.

Where a mixed population of weeds has presented difficulties in the use of either MCPB or dinoseb alone, a combination of 10 lb of MCA and ¾ lb of MCPB has given excellent results. This has proved superior to mixtures of MCPB and dinoseb. The use of both a systemic weedkiller and a contact one at the same application would be expected to result in a reduced effectiveness from each, but this does not occur with MCPA-MCA mixtures.

—*W. F. LEONARD, Christchurch*

* * *

TURNIPS FOR SUMMER FEED

SUMMER turnips, an excellent crop for the dairy farm, should be ready for grazing by January, when pasture growth often provides insufficient feed for the herd. Quick growing varieties such as N.Z. York Globe, N.Z. Purple Globe, or, for February feeding, N.Z. Green Globe should be sown in a well prepared seedbed by the end of October with 2 to 3 cwt of reverted or serpentine superphosphate per acre. Where brownheart occurs borated superphosphate should be used.

The crop is best rationed to the cows by use of an electric fence. The herd should be run on the turnips for an hour or two after the morning milking, the fence then being shifted to include the next day's ration. Where some pasture is available an acre of turnips should be sufficient for 10 to 12 cows for eight weeks or more.

Beside providing additional feed at a time when it is needed to maintain production, the growing of summer turnip crops fits in well with a pasture renewal programme. Generally the turnips would be fed off in time for the ground to be prepared and a pasture mixture to be sown in March.

—*R. W. GOODALL, Motueka*

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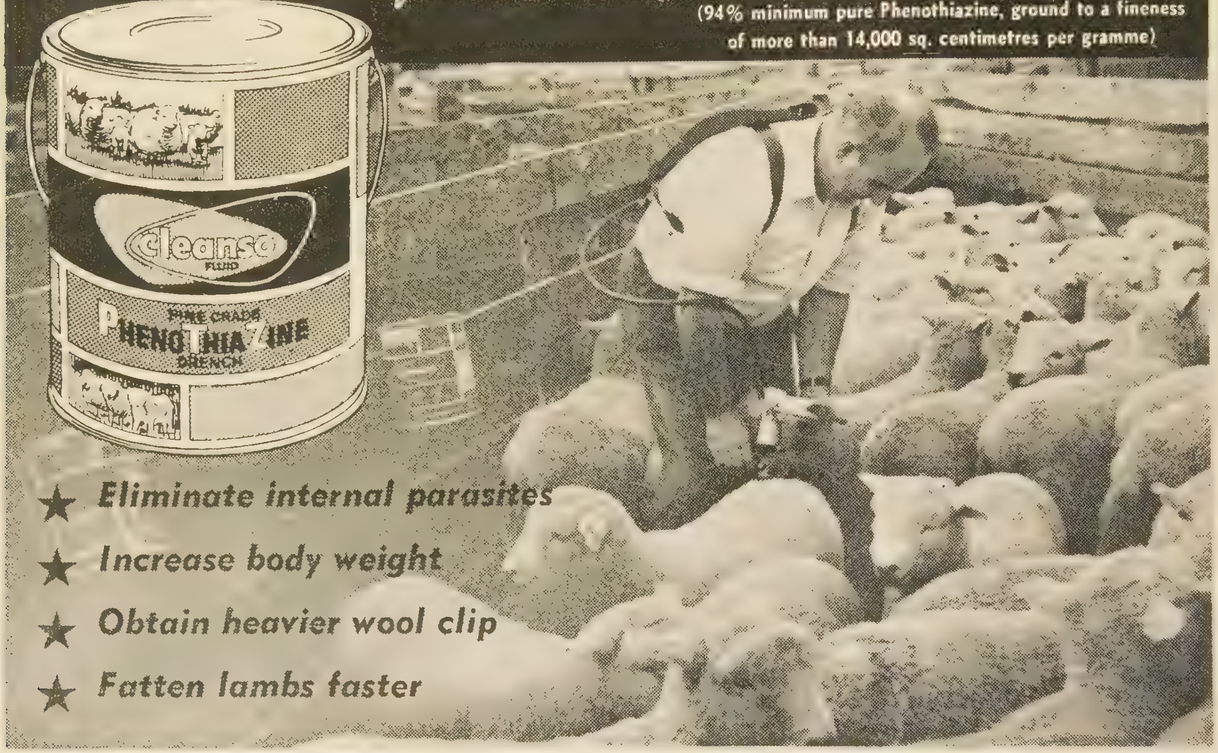

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Moving Hives that are not Bee-tight

By L. J. S. LINE,
Apiary Instructor,
Department of Agriculture,
Hastings

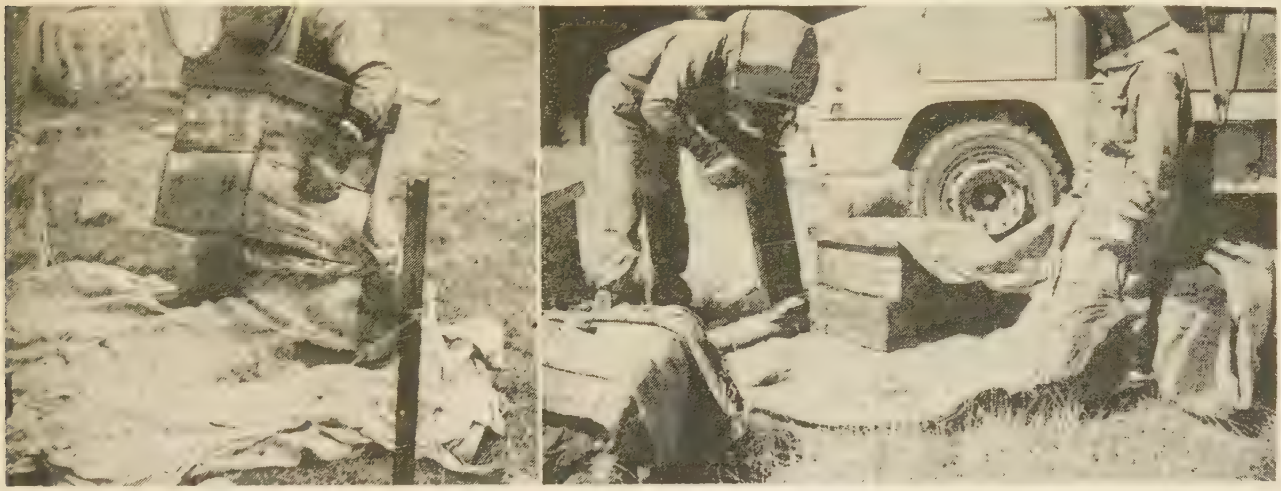
TRANSPORTING bee colonies to new locations is common practice in modern beekeeping. In apiaries where all hive equipment is standard and well maintained beekeepers can prepare hives for transport quickly and in a straightforward manner by the use of wire screens and other simple measures. However, beekeepers sometimes find it necessary to acquire or buy hives for removal which are so damaged or deteriorated that it is difficult to prevent bees from escaping through openings in the hive boxes during transport.

THE following method solves the problem of transporting bees when damaged hive boxes or non-standard equipment could make the move difficult.

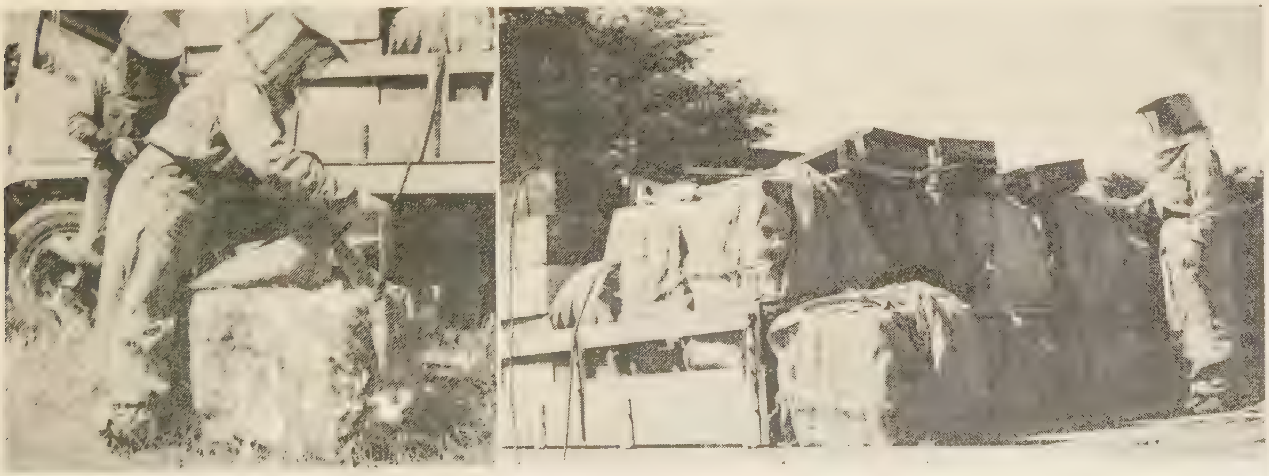
Sack wraps about 8 to 9 ft square (large enough to wrap up a two-super hive minus the bottom board) are used. A hive is lifted from its bottom board on to the middle of a wrap. The four sides of the sacking are brought over in neat folds and secured at the top with a half-knot. The wrap is then bee-tight and ready for loading on to a truck.

Use of Flour Sacks

Sound, full-sized flour sacks are recommended. Four sacks cut along the sewn joint and opened out are sewn to each other to form a square. For tying the overlap at the top of each wrap two tags are provided by 3 in.-wide strips extending out 2 ft from two opposite sides. A half-knot is all that is required to secure the



LEFT—After being smoked at the entrance the hive is lifted on to the wrap. The bottom board is collected up afterward. RIGHT—The first stage of wrapping, showing bees on the bottom board being dumped on the sack beside their supers.



LEFT—After the loose part of the wrap has been tucked in, the two tags are tied in a half-knot and the hive is ready for loading. RIGHT—A number of wrapped hives stacked on a truck. The bottom boards are placed over the top and a rope is passed over them for the final tying of the load together.

wrap, as the friction of the sacking keeps the wrapping together.

The cost of getting the sacks sewn together by commercial machinists varies from 9s. 5d. to 11s. 6d. per square. Eight squares have been sewn up for £3 15s.

In the cooler months of spring the bees sound quite contented travelling within the wraps, but during hot weather some 6 x 1 in. boards at 18 in. intervals across the deck of the truck are necessary to give added access for air from underneath during longer journeys. When the wrapped hives are stacked on the truck they ride quite smoothly over rough roads owing to the springiness provided by the wraps.

If hives have to be on the move for several hours in hot weather, it is advisable to toss sufficient water over the load to dampen the wraps and ensure the hives arriving at their destination in good condition.

Electric Fences on Hill Country

THE multi-wire electric fence is cheap, light, and easy to erect. It offers tremendous advantages over conventional fencing because freight charges are reduced, skilled labour is not required, and the cost per mile is low.

However, if you are one of the many farmers planning to erect electric fences on your hills, the following suggestions may be helpful:

It is only a few years since the first permanent-type electric fence was built. Designs and ideas are changing rapidly so look round carefully before buying equipment.

The cheapest insulators are 4 in. lengths of split polythene tubing fitted over the live wires and firmly wired to standards, but it is not known how long the polythene will last.

The offset bracket system of insulating the wires is more expensive, but is very easy to assemble and should last many years if the brackets are rustproofed.

There is a real need for a light weight insulated standard, preferably slightly flexible so that it can withstand rough treatment without breaking or permanently bending.

It is difficult to keep all fences clear of grass and weeds, and though an overgrown fence may still carry sufficient shock to control animals already trained to respect electrified wires, the weak pulsations may be quite inadequate to hold untrained stock. So it is advisable to consider very carefully before erecting an electric fence on a roadside or along a plantation or gully where one side will be left ungrazed.

—*R. G. WARREN,*
Farm Advisory Officer,
Department of Agriculture,
Dannevirke

Aborting Cows May Have Brucellosis

DAIRY farmers who find one or two of their cows aborting can strongly suspect contagious abortion or brucellosis as it is sometimes called. Infected cows are a direct danger in spreading the disease in paddocks where other cows are grazing; they can cause "storms" of infection through the herd.

Brucellosis can be easily prevented. One injection of vaccine will immunise a calf for a long time. By adopting a vaccination policy for his heifer calves and brought-in replacements a farmer can keep his herd free of this costly disease.

Early inquiry should be made of Departmental officers or club veterinarians to ensure inclusion in the heavy programme of vaccinations starting in January and February. Vaccination is a first-class insurance cover. It is shortsighted for a dairy farmer to be without it.

Protecting Stored Silage from Weather

PROTECTION of silage from the weather, and particularly from the damaging and leaching effect of rainfall, is most important in maintaining its quality. This has been emphasised since the recent introduction of various types of flail harvesting machines and attempts by many dairy farmers to harvest and store material of higher than normal average quality.

Sound galvanised iron roofs over silage pits and trenches ensure permanent and complete protection of material. Plastic covers have been widely adopted for silage and give good protection from both rainfall and exposure to the air. With careful use plastic covers will serve several seasons. Their cost is now reasonable and quality of the material has improved considerably.

Many farmers still use the laborious method of earthing silage in all types of containers as a means of top consolidation and surface protection from the weather. Wherever it can be obtained cheaply and in quantity a 9 in. to 12 in. covering of sawdust has also proved to be quite effective in protecting silage from surface wastage. Sawdust also provides a cover that deters biting flies, which breed in early cut, warm, moist silage.

Leaching by rainwater is generally the main cause of losses in the quality of stored silage, and the complete protection of material depends largely on the type of storage container used. For example, it is much easier to cover and protect material completely in underground trenches and pits than it is in overground clamps, wedges, or stacks. Side waste through exposure to weather and air can be considerable in these latter types of containers.

—*J. M. HOPKINS,*
Farm Advisory Officer,
Department of Agriculture,
Levin

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Government Approved Turnip and Swede Seeds

THE varieties of Government approved seed of turnips and swedes being distributed in 1960 were discussed in the "Journal" in October 1959. To attain uniform quality within a variety irrespective of the district in which seed is sold all seed of each variety is blended before being packeted into 1 lb and 2 lb calico bags labelled as Government approved, and carrying a Departmental overstamp.

The seed of every variety being distributed to retailers in 1960 has a germination of 90 per cent or higher. If seed of any variety from an earlier distribution is still available from retailers, a sample should be subjected to a fresh germination test before sale.

◆

Yearling bulls showing 50 lb difference in weight gain since weaning.

Ruakura Recommendations for

Selecting a Beef Bull

- Select a stud that can provide weight for age records.
- Select a stud where the cows are run as a commercial herd on cattle country.
- Pick out for inspection the best half dozen bulls on a weight for age basis.
- Examine them and reject for bad feet, jaws, temperament, and conformation, in that order.
- Be prepared to pay a premium in time and money to find a bull measuring up to the necessary standards.

THE objects of a beef breeder are similar to those of a dairy farmer who sells butterfat by the pound; beef breeders sell meat by the pound and, as with the dairyman, production per acre is the index of efficiency.

Accordingly, whether weaners or fats are to be sold, good weaning weights are the key to maximum returns, and good milking cows are the prime essential of heavy weaners. Growth after weaning is independent of weaning weight, so a 550 lb weaner after gaining 600 lb in the next 12 months is ready for slaughter, but a 400 lb weaner, even after gaining 600 lb, is still too light to kill before that economically critical second winter.

With meat production per acre in mind, it is suggested that commercial beef breeders follow the lead taken by their dairy counterparts 12 years ago and select their bulls on production characteristics; that is to say, on "weight for age". Obviously, commercial beef men are quite aware of its value, for at bull sales the heavier the bull that enters the ring, the higher the price that is paid for him.

Adapted from a paper presented to this year's Ruakura Farmers' Conference by R. M. GALLAGHER, Technical Officer, Department of Agriculture Animal Research Station, Ruakura

This policy is sound only to a degree, for it does not take into account many factors, such as variations in nutrition or the "crimes" of nurse cows and special feeding of "poor doers".

If beef breeders are to put bull selection on a sounder basis, they must first be prepared to spend at least a few days making the selection, for £200 to £300 is to be invested in a bull which should last at least five years and will have daughters in the breeding herd for another 10 to 15 years. He can be a good or bad investment, returning or costing a lot of money in that time.

Therefore, the stud from which it is intended to buy should be carefully selected. It should be a stud where at least the breeding cows are run on cattle country as a commercial herd. Many farmers who have bought a bull bred on rich flat country have turned him out on the hills only to find that he "packed up".

The selected stud must have birth dates, weaning weights, and subsequent weights available, and these must be studied before the bulls are ever looked at, for there is a serious risk of taking a fancy to a bull before enough is known about him to make an intelligent evaluation.

I know of only seven studs which have these records available, but they offer some 330 bulls for sale annually and there should be no difficulty in finding from them the type of bull required.

These figures should be gone through and each bull evaluated to take advantage of the large genetic variations for growth which exist within studs.

TABLE 1—BULL EVALUATION

	Stud average	Bull A	Difference
	days	days	days
Weaning age ..	270	274	+4
	lb	lb	lb
Weaning weight ..	460	490	+30 (+24)
Yearling weight ..	545	595	+50 (+46)
21 months' weight	1,105	1,210	+105

In Table 1 the figures on the right in brackets are corrected for age by adding or subtracting 1½ lb per day as a weaner, and 1 lb per day as a yearling for each day older or younger than the average.

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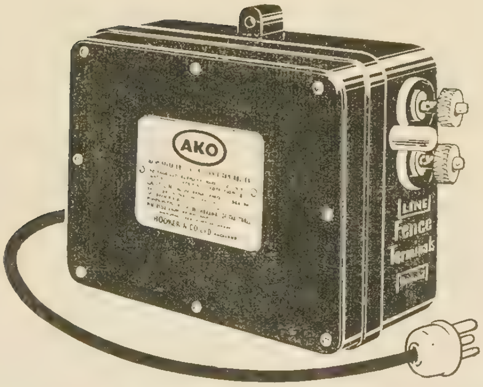

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This bull's age in relation to the average age indicates that his mother got in calf probably to the first mating. His weaning weight is 30 lb better than the average, indicating that his mother was a better than average milker.

No New Zealand data are available yet on the relationship of milk production to weaning weight, but overseas work suggests that about 70 per cent of differences in weaning weight is due to variations in dams' milking ability. Milking ability is very important; the heaviest weaners will still be the heaviest animals 12 months later.

The figures of +50 lb and +105 lb for yearling and 21 month weights show that this animal, in addition to a good mother, had good genetic ability for growth. This is the type of herd sire needed if 600 lb carcasses are to be produced under two years of age.

Pick out about six of the best bulls on this basis, remembering that adjustments may need to be made, particularly to weaning weights, for birth date and age of dam. Cows between five and nine years of age should produce their heaviest weaners. For example, a three year old's weaner will be about 30 lb lighter than average.

These half dozen bulls with the best weight for age should then be closely inspected for such bad characteristics as poor jaws or bad feet, tendencies which are both strongly inherited. Illustrated are a pair of four-year-old identical twins that were subjected at Ruakura to high and low planes of nutrition. The thin bull's feet remained as bad as his heavy mate's.

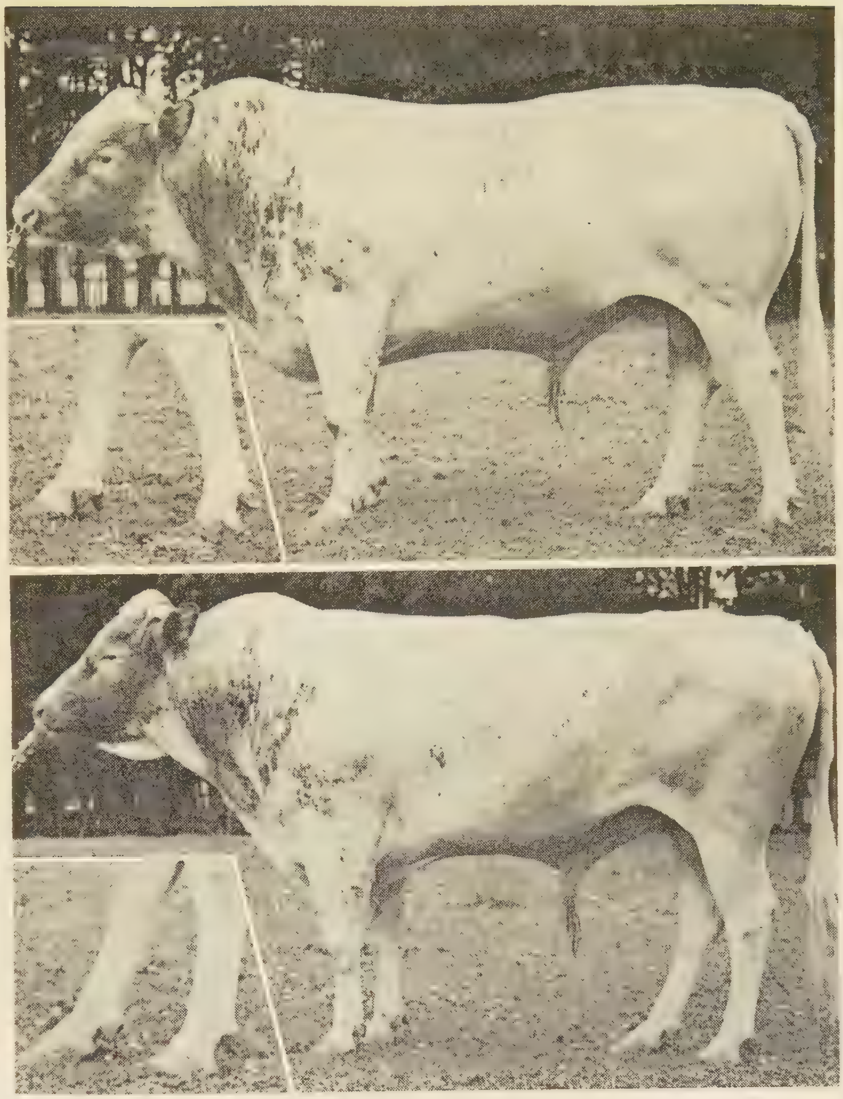
Watch closely for the animal whose feet have been trimmed. If they have needed trimming at two years of age, think how bad they will be when he or his daughters are 10 years old.

If you are buying a Hereford, select an animal with a "cherry eye". Recent work has shown that eye cancer is rare in Herefords with well pigmented eyelids and could be reduced to a negligible level by breeding from such animals, but the British and New Zealand Hereford Breed Societies prefer non-pigmented eyes.

Next study the temperament of the animals, as there is ample evidence that temperament is quite strongly inherited **and** a suggestion that docile animals, apart from ease of handling, tend to fatten more quickly and yield a better quality carcass.

With the field narrowed to one or two, it is well worth while inspecting the sires, and if possible the dams, before making the final selection.

No mention has been made of type or conformation. There is room for this in the final selection from the small group inspected, but here is a final thought: you are breeding beef, not beauty!



The inset enlargements of the hind feet of the identical twin bulls above illustrate that bad feet are an inherited defect.

The French Charollais, the American Santa Gertrudis, and other Zebu or Brahman type cattle are humped, goose rumped, and ugly by traditional British beef type standards, but are nevertheless famed for their fleshing and cutting qualities.

It is not suggested that we change to these breeds, but it is suggested that we may have to relinquish some of our long cherished ideals in this rapidly changing world of pre-cut meat.

This new trade has much to commend it, especially where long distance and high transport costs are involved, for only edible material is shipped, greatly reducing space requirements and handling costs. Both distributor and consumer see the cuts they are handling and buying only in transparent cellulose wrapping. Consequently they are little interested in the original conformation of the beast. Eye appraisal is on the way out.

Finally, but by no means least important, purchase subject to a fertility guarantee on which your local veterinarian will advise you.

A bull selected in this way will cost more than the average, but Table 2 shows the additional direct cash return that can be expected in addition to the long-term effects of the heifers left in the breeding herd.

TABLE 2—ESTIMATED ADDITIONAL VALUE

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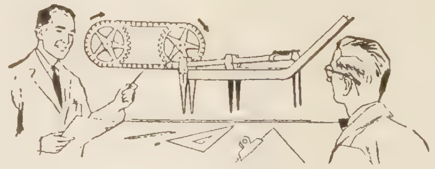

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Vegetable Growing for HOME and MARKET GARDENERS

Outdoor Tomato Varieties

By I. G. FORBES,
Assistant Horticultural Superintendent, Department of Agriculture, Dunedin

HUNDREDS of varieties of tomatoes are in use in various parts of the world. Many of these would not be adaptable to New Zealand conditions, but some which are not yet grown here will undoubtedly have a place and others may be useful as a source of breeding material to provide some particular characteristic, such as resistance to disease, which may be required in this country.

MANY varieties are grown in home gardens in New Zealand, but commercial growers have narrowed the number down considerably because the type of fruit they must produce is often quite different from that which suits individual home gardeners. Processors of tomatoes want firm fruit with a high percentage of solids and a fairly brief harvesting period. Home gardeners can afford to grow softer-fruited varieties if they prefer them, and harvesting over a prolonged period is an advantage.

Culture of Tomatoes

Home gardeners: Full details of the culture of tomatoes are given in Department of Agriculture Bulletin No. 342, "The Home Vegetable Garden", 4s. This may be obtained from main offices of the Department and from booksellers.

Commercial growers: Advice about the growing of commercial crops may be obtained from Horticulture Division officers in the main producing areas.

Dwarf Varieties

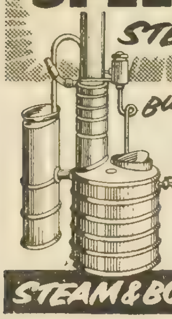
Two of the main varieties used for processing are Scoresby and Tatinter. These dwarf bush varieties have a common origin and were released by the Tatura Research Station, Victoria.

Scoresby, known as KY1 in Australia, has broad leaves which give good fruit cover, and the fruit, which is flattened round, has little of the objectionable lobing of varieties such as Adelaide Dwarf and to some extent Tatinter. Scoresby produces a high percentage of good canning quality fruit.

Tatinter matures a little later than Scoresby. The fruit is flattened and sometimes rather lobed. It is very firm and travels well.

There is a need in New Zealand for a good variety for producing canned whole tomatoes. Small, round, bright-coloured fruit, high yields per acre, and consistently good quality are the requirements. Trials are being made with Stonors Dwarf Gem, a variety that was first grown in New Zealand 12 years ago, at the Crop Research Division, Department of Scientific and Industrial Research, Lincoln. Yield per plant is not as high as with Scoresby or Tatinter, but the plants may be grown closer together. Fruit is mainly small, round, bright coloured, and matures evenly. The variety is very susceptible to spotted wilt.

Early Chatham, **Victor**, and **Puck** are other varieties which have been tried for producing canned whole tomatoes, but none has proved suitable. Early Chatham is favoured as an early



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Varieties for Main Growing Districts

The present popular varieties for home gardens, market growing, and growing for processing are shown below. Many other varieties are grown, especially in home gardens.

	HOME GARDEN	MARKET	PROCESSING
AUCKLAND	**Staked** Potentate Oxheart (Beefsteak) Best of All Moneymaker **Dwarf** Tatinter South Australian Dwarf	**Staked** Moneymaker Potentate **Dwarf** South Australian Dwarf Mangere Pale Leaf	**Dwarf** Tatinter South Australian Dwarf
PUKEKOHE	**Dwarf** As for Auckland **Staked** As for Auckland	**Dwarf** Early Chatham Mangere Pale Leaf South Australian Dwarf **Staked** Moneymaker Potentate	**Dwarf** South Australian Dwarf Tatinter
GISBORNE	**Staked** Potentate Best of All	**Dwarf** Scoresby Tatinter	**Dwarf** Scoresby Tatinter
HASTINGS	**Staked** Potentate Best of All **Dwarf** South Australian Dwarf	**Staked** Potentate **Dwarf** Scoresby Tatinter	**Dwarf** Scoresby Tatinter Stonors Dwarf Gem
OTAKI-MANAWATU-WELLINGTON	**Staked** Best of All Potentate Big Boy Grosse Lisse **Semi-dwarf** Russian Red	**Staked** Moneymaker	**Dwarf** Tatinter
NELSON	**Staked** Potentate Stonors Exhibition Halls Stake	**Staked** Potentate Halls Stake	**Staked** Halls Stake **Dwarf** Tatinter South Australian Dwarf
CHRISTCHURCH	**Staked** Potentate Best of All Kondine	**Staked** Kondine Carters Sunrise Harbinger Stonors Early Market	**Dwarf** South Australian Dwarf

outdoor tomato in the Auckland district. Victor did quite well in trials at the Crop Research Division, but should not be planted as a late variety. It is susceptible to greenback. Puck is an erect bush variety with small, round fruit, but its yield is generally too low for commercial requirements.

Staked Varieties

Moneymaker, which produces smooth, bright, evenly maturing fruit, is a popular staked variety.

Carters Sunrise, a well known variety noted for its high quality, orange-red, smooth, round fruit, is used extensively as a late outdoor tomato on the Port Hills near Christchurch and in Central Otago.

Levin Research Station Trials

Last season a trial of outdoor varieties was conducted at the Department of Agriculture's Levin Horticultural Research Station. Those included were two strains of Potentate, Improved Bay State, V-548, Ware Cross, Carters Sunrise, Moneymaker, and a grower's selection believed to be from a cross between Oxheart and Halls Stake, the last a variety widely grown in Nelson.

The **grower's selection** and **Ware Cross** gave the heaviest **yields** followed in order by Carters Sunrise, Potentate, Moneymaker, V-548, and Improved Bay State.

Moneymaker was best for **shape** and **colour** of fruit, with **Carters Sunrise** almost as good. V-548 was poorest in score for these characters. **Ware Cross** was the best variety in the trial when both yield and fruit quality were considered.

Combating Leaf Mould Disease in Glasshouse Tomatoes

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

LEAF mould disease (*Cladosporium fulvum* Cooke) is a most troublesome disease among glasshouse tomatoes. Spraying, use of resistant varieties, and good ventilation all have a place in combating this disease.

LEAF mould is characterised by downy patches, pale buff to tawny brown or grey, with perhaps a white margin, which appear on the undersides of the leaves. Usually the lower leaves are attacked first and the disease unless checked spreads up the plant, the upper surfaces of the leaves turn yellow, the spots spread, and tissue dies progressively. Flowers if attacked may fail to set.

Spraying

Most growers spray regularly, though some use a phenyl mercury aerocide. The latter has the advantage that it takes little time to apply, but a disadvantage is that the house must be shut completely and the temperature kept high (about 70 degrees) for at least two hours, which provides excellent conditions for the development of the spores of leaf mould. Repeated treatments are usually necessary with a consequent considerable risk of build up of poisonous mercury residues.

Orthodox spraying with knapsack sprayer, stirrup pump, or power pump is time consuming and usually means applying spray until it runs off. The excessive moisture encourages the development of the disease, and the heavy application of spray leaves visible residues, which must be wiped off the fruit. Often also some damage is done to the crop when spray equipment is moved about.

One of the most effective ways of applying spray materials in a glasshouse is with a paint spray gun. A good gun will give a mist-like, effective spray coverage, yet will not leave a noticeable deposit on fruit. As the spray gun is relatively small, the operator is no more likely to damage plants when spraying than when carrying out operations such as pruning or watering.

Detailed information on the use of paint spray guns for spraying glass-

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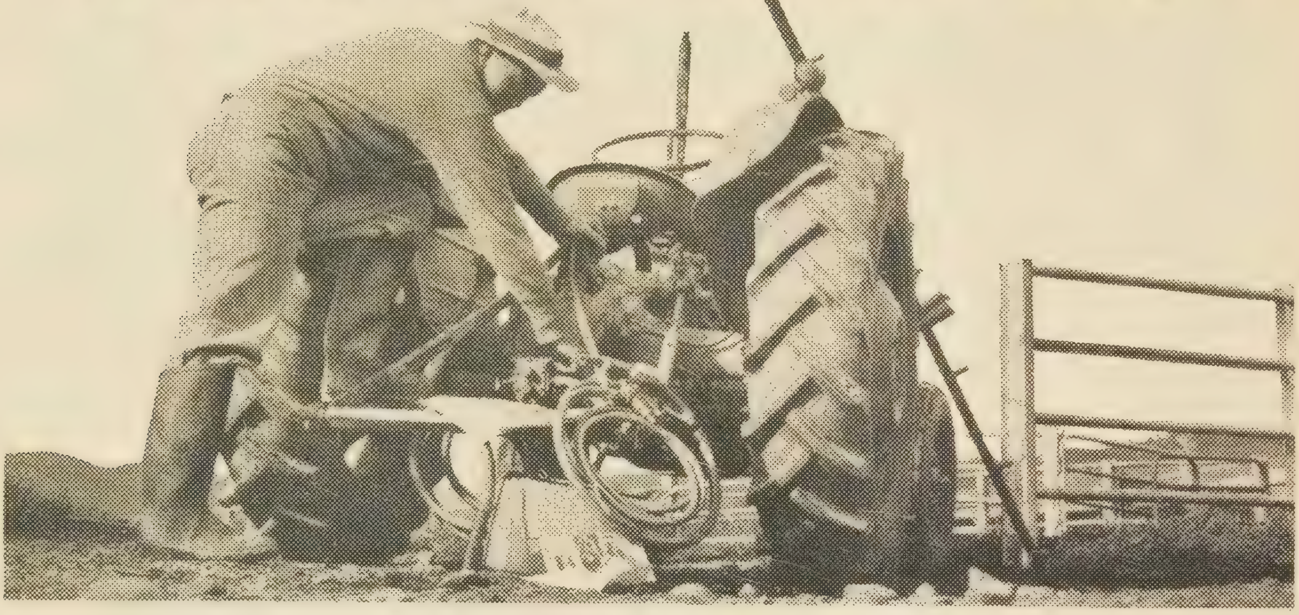

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house crops was given in the March 1959 "Journal" (pp. 253-259).

Thiram, salicylanilide, captan, copper oxychloride, and zineb can be applied effectively with a paint spray gun. At the Department of Agriculture's Levin Horticultural Research Station applications at 10 times normal concentration caused no damage. Zineb and salicylanilide are widely used for controlling leaf mould, but captan and thiram will also check the disease and phygon has given very good results in trials.

Resistance of Commonly Grown Varieties

Tomato varieties differ greatly in their resistance to leaf mould, but the importance of growing any crop in the best possible conditions cannot be overstressed. Correct watering and feeding to develop a well balanced plant and adequate ventilation and spacing are important. The relative resistance to leaf mould of some varieties commonly grown commercially will be discussed. It will be a general guide only, because some varieties may respond differently according to interacting conditions of light, temperature, moisture, and nutrition and sometimes according to the strain of the variety.

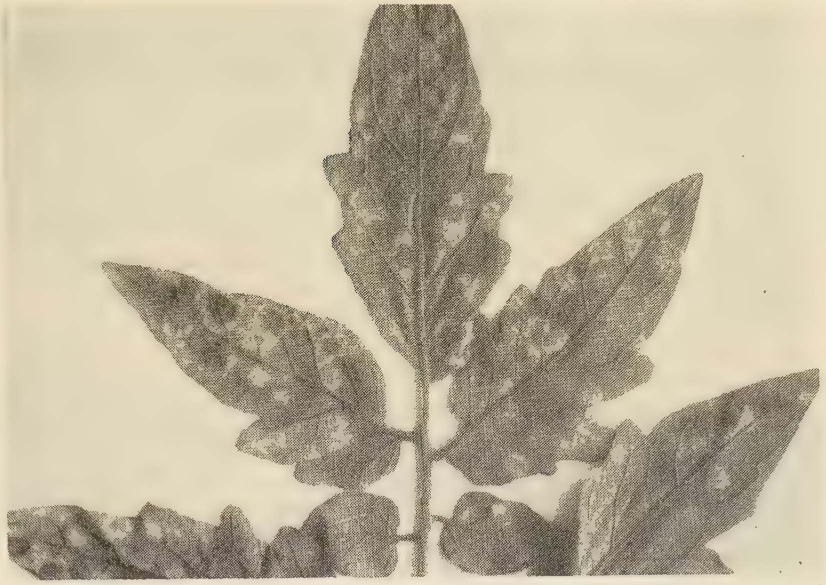
Good Resistance

V-548 is the most resistant variety and was introduced into New Zealand because of this. It is vigorous and comes into bearing early, though in some houses its fruit tends to be rather larger than is preferred by commercial growers. In trials it was comparable in earliness, percentage of good fruit, and yield with some of the best of the commercial varieties. Non-infective leaf mould lesions have developed on it in some districts, though it still appears to be retaining its immunity.

Improved Bay State is another variety introduced several years ago because of its immunity to leaf mould. It is no longer immune, though it is still one of the most resistant varieties; the disease develops on it to only about a quarter the extent it does on Potentate, a comparatively resistant variety. Improved Bay State is a very vigorous variety which comes into bearing little later than Potentate. It produces heavy crops of good quality fruit which keeps well and is rarely affected by greenback. In some houses the fruit tends to be a little larger than is preferred by some commercial growers.

Syston Cross, a vigorous first early variety, is immune to most of the strains of leaf mould in New Zealand. The fruit is of good size and quality and the yield is good, but some of the plants are likely to be affected by necrosis which causes them to collapse.

Potentate is more resistant to leaf mould than several varieties that produce fruit of better quality and is still the most widely grown commercial variety. The rooting system is comparatively weak, but under suitable conditions plants yield heavily. Growers value especially the good setting of the bottom trusses, the most paying ones for most commercial producers.



[*Department of Scientific and Industrial Research*

Downy patches on tomato leaf.

Hereford Cross has resistance similar to that of Potentate. It is not as early as V-548, Improved Bay State, Potentate, or Ware Cross and its yield is usually lower and fruit sometimes small.

Susceptible

Ware Cross, though a very early, vigorous variety capable of producing a heavy crop of solid, well shaped fruit of good quality and colour, is susceptible to leaf mould.

Moneymaker is very susceptible to leaf mould. It does not come into bearing as early as Ware Cross, Potentate, or V-548, but in conditions which suit it produces fruit of excellent shape, size, and quality and yields heavily. It is free from greenback, which is often troublesome, particularly late in the season, on Ware Cross, Potentate, and other varieties.

November Work in the Home Garden

By A. G. KENNELLY

RISK of frost damage has passed by November except in a few southern districts early in the month and the ground has warmed enough for good growth of half-hardy plants such as dwarf and runner beans, pumpkins, sweet corn, and tomatoes. Successional or main-crop sowings can be made of root crops and potatoes can be planted. Successional, preferably small, sowings can be made of crops for salad use such as lettuces, mustard and cress, radishes, and spring onions.

LATE autumn, winter, and early spring crops are just as important as summer ones and in all except most favoured mild northern districts, seeds of plants such as savoy cabbage, winter cauliflower or broccoli, fine-leaf kale, leeks, and parsnips should be sown, or preferably seedling plants should be established early in November for setting out in December, January, or,

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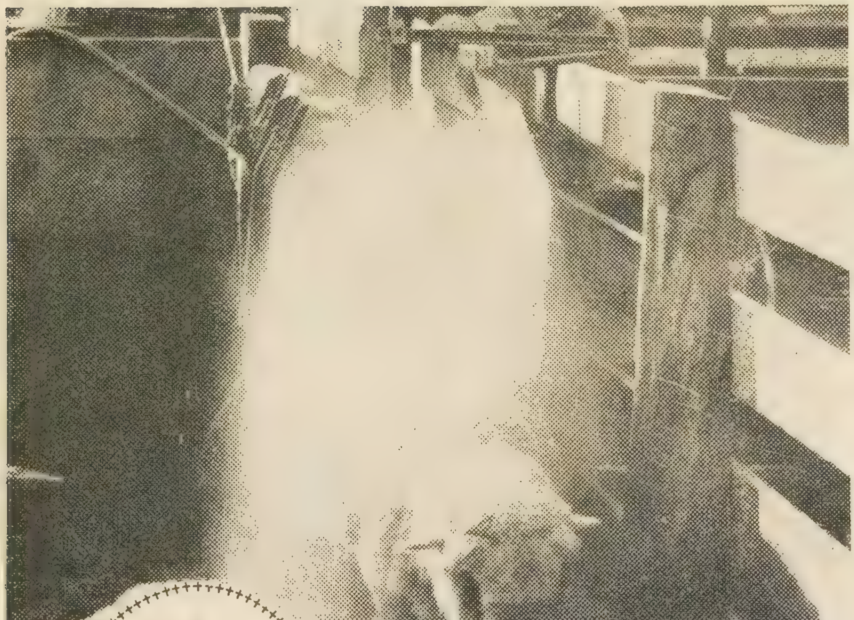

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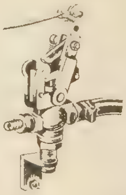

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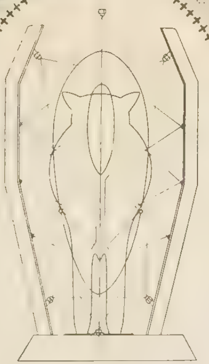

"Orbital coverage" diagram of spray pattern showing now overlapping sprays give **all round** coverage.

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at the latest in all except the mildest districts, early February.

Successional sowings of peas can be made where the soil is not likely to become excessively dry. Where conditions are favourable celery plants, either self-blanching or green, can be set out.

Crop rotation should be practised and crops should be kept weed free by hoeing with a sharp hoe. Thinning should be done as soon as seedlings are large enough to be handled conveniently so that the remaining plants are not disturbed too much.

Liquid Manure

Plants, particularly those grown for leafy qualities, that tend to slow in growth owing to the exhaustion of some plant nutrients in the soil may be stimulated by a topdressing of nitrogenous fertiliser. Sulphate of ammonia or nitrate of soda is suitable, though where conditions tend to be dry, regular applications of liquid manure may be more effective. This can be made by dissolving sulphate of ammonia or nitrate of soda in water (at about 2 oz to the gallon) or by suspending a partly filled sugar bag of animal manure in a large container of water and using the liquid.

SOWING AND PLANTING

Sow or Plant when Frost Danger has Passed

Beans (dwarf and runner), cucumbers, marrows, New Zealand spinach, pumpkins, squash, sweet corn, tomatoes, yams. In specially favourable situations: Egg plants, kumaras, melons, okra, peppers.

Successional or Main-crop Sowings

Beetroot, cabbages (summer and pickling), carrots, cauliflowers, Chinese cabbages, celeriac, herbs, kohl rabi, lettuces, onions for salads, parsnips, parsley, radishes, salsify, scorzonera, silver beet, spinach beet, swedes, tampala, turnips.

Plants and Tubers to Set out as Required

Brussels sprouts (an early planting if necessary), cabbages (summer or autumn), cauliflowers, celery, celeriac, cucumbers, lettuces, potatoes (late planting if desired).

Beetroot and carrots can be transplanted in favourable circumstances.

*Sow for Winter Use as Required

Broccoli, brussels sprouts, cabbages (savoy or winter), kale or borecole.

* Except in favourable far northern districts, when later sowing is satisfactory.

Control of Insect Pests

With the advent of warm weather, insect pests become more troublesome. Aphids (green fly or black fly) attack a wide range of crops and should be controlled with nicotine sulphate or lindane sprays at the first sign of infestation. If nicotine is used, a little soap should be added to the spray to activate it. The temperature should be above 60 degrees F for this spray to be effective.

Caterpillars are also liable to be troublesome, but most species that attack vegetables can be controlled by spraying with DDT or lindane. The former protects crops longer.

Many home gardeners tend to rely on spraying alone to combat insect pests, but good husbandry in which crop hygiene, rotation of crops, and early removal of diseased plants are practised, is as important. Crop hygiene means that all infested rubbish should be burnt or buried deeply after a crop has been harvested. Plants should not be set too closely, because the dense growth which results from close planting usually provides good shelter for insects and makes it difficult to reach them with sprays.

Eelworm

Crop rotation is most important with root diseases and where eelworm is troublesome. If crops affected by eelworm can be rotated with cover crops of barley or oats, the eelworm population will be reduced. It is preferable to grass down for several years but, even if ground is in a cereal for one season, infestation will be greatly reduced. Grasses and cereals are resistant to eelworms and asparagus, onions, cabbage, cauliflower, celery, sweet corn, parsnips, carrots, radishes, rhubarb, spinach, and turnips though attacked are not affected much.

Maturing lettuces are often attacked by botrytis rot at this time of year. The usual symptom is collapse of plants due to rot which starts at the stem base and finally reduces the centre of the plant to a soft, rotten mass. The only practicable method of control in the home garden is to remove and destroy affected plants as soon as they are noticed, to set out only plants that are healthy and undamaged, and to space plants to allow free movement of air round them.

To grow well tomatoes need disease free soil and a warm situation.

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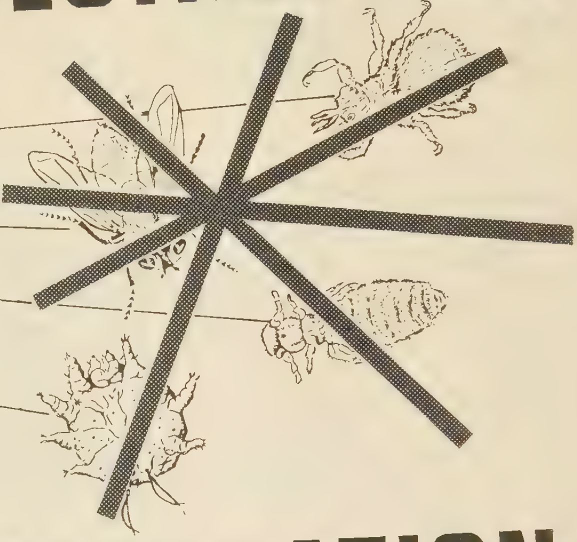

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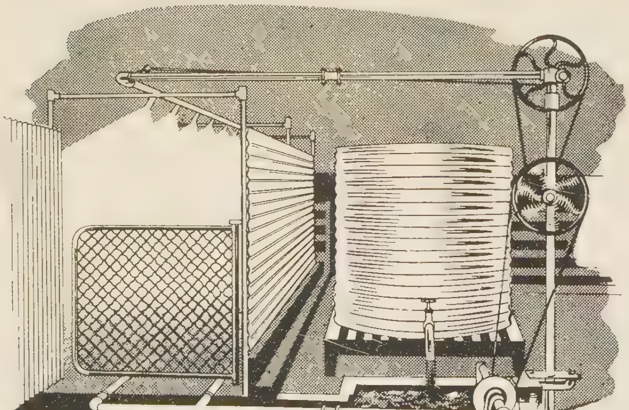

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SUMMING UP Advantages were in favour of early shearing according to the results of trials at Ruakura presented by Dr L. R. Wallace, Senior Principal Scientific Officer at the Department of Agriculture's Ruakura Animal Research Station, in a paper to this year's Farmers' Conference. An adaptation of the paper follows.

MANY fat lamb farmers send the first draft of lambs to the works fat off their mothers in December and wean the remaining lambs more or less immediately. Sometimes the lambs that remain are shorn at this stage, but often shearing is deliberately postponed until one or more further drafts have been disposed of during January and February.

Farmers who shear early believe that the weaned lambs grow faster and fatten more readily if shorn, while those that delay shearing think that shearing exerts only a small influence on the rate at which the lambs fatten.

Results of Trials

A small amount of information has so far been obtained at Ruakura in two trials, one in 1958-59 and the other in 1959-60, to see how the growth of lambs shorn shortly after weaning compared with that of similar lambs left unshorn.

Each year the lambs used were bred from Romney ewes that had been mated with Suffolk x Southdown rams, and consisted of lambs that remained after a first draft had been taken at the beginning of December. At this stage the lambs were weighed and divided into two similar groups, both of which were immediately weaned. One group was shorn as soon as this could be managed and the other was left unshorn.

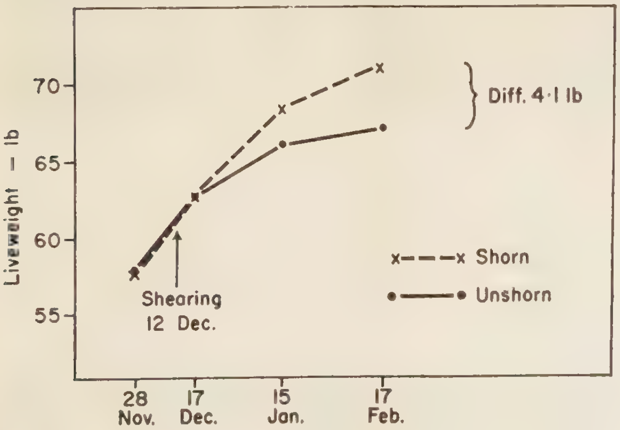
The growth curves of the lambs are shown in the graphs on this page. In order that the comparisons should be quite fair, in drawing the curves the average weight of wool removed at shearing was added to the average liveweight of the shorn lambs.

Each year the average weights of the two groups of lambs were almost exactly the same at the start of the trial, but shortly after shearing the growth curves began to diverge, the shorn lambs gaining faster than the unshorn.

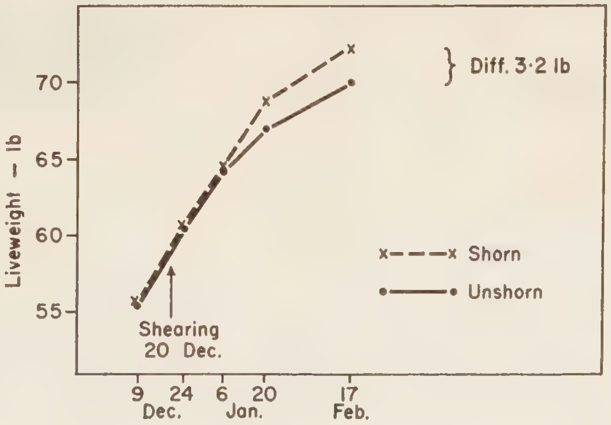
Each season the lambs were weighed for the last time on 17 February, about two months after shearing. At this stage there was in the first year an average liveweight difference of 4.1 lb in favour of the shorn lambs and in the second year a difference of 3.2 lb, again in favour of the shorn animals. The weight difference was thus a little greater in the first year, when the lambs grew rather poorly, than in the second, when they fattened quite readily.

These differences in liveweight may appear disappointingly small, particularly when it is remembered that they need to be about halved to translate them into terms of pounds of carcass weight. Nevertheless, they are sufficiently large to be of considerable practical importance. An average liveweight difference of 3 to 4 lb between lines of lambs can have quite a substantial effect on how the lambs grade. Thus each year at Ruakura there were a greater number of Down and Prime carcasses and fewer seconds and rejects among the shorn than among the unshorn lambs.

EFFECT OF SHEARING ON LAMB GROWTH, 1958/59



EFFECT OF SHEARING ON LAMB GROWTH, 1959/60



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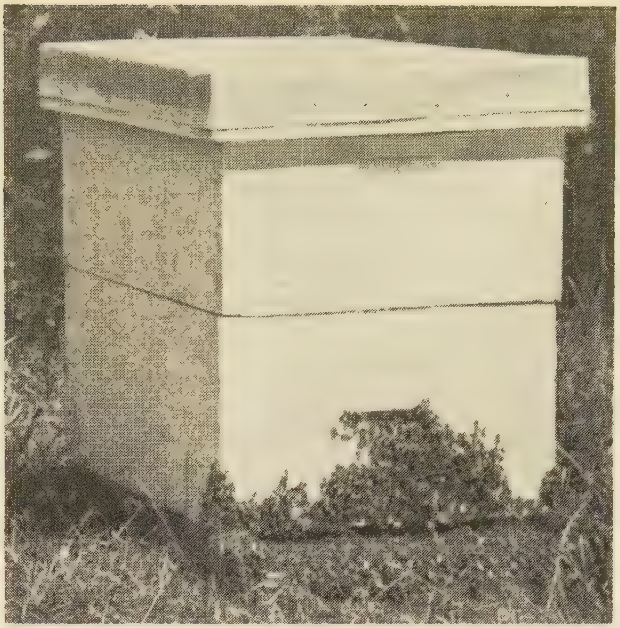
Seasonal Notes for the Domestic Beekeeper

Swarming and Swarm Control



[Rendell's

Hive overcrowded with bees and needing additional supers and ventilation. In this condition the colony begins to raise swarm cells.

WITH the advance of spring, bee colonies become more populous and there are early signs of swarming. Swarming is a natural corollary of brood rearing; by casting one or more swarms each year bee colonies in their natural state increase their numbers as a means of preserving the species. In modern beekeeping, however, swarming is unnecessary and undesirable if maximum surplus crops of honey are to be secured. In this article R. H. HOBBS, Apiary Instructor, Department of Agriculture, Greymouth, refers to factors which promote the swarming impulse in bee colonies and the measures by which beekeepers can prevent swarming or reduce it to a minimum.

SOME races and strains of bees are more prone to swarming than others. Efforts must be made to eliminate this undesirable trait by careful selective breeding. Queens selected for breeding from colonies whose progeny show little tendency to swarm, or use of queens from colonies which supersede their queens season after season without swarming, will assist in developing strains of bees that are less likely to swarm, except under exceptional circumstances.

Most commercial strains of bees in this country are Italian bees. It has taken many years of selection and breeding to establish the high quality strains of them that are available. This race of bees has proved to be best under most conditions in New Zealand for the production of honey. They are gentle, vigorous workers and usually have a low propensity to swarm. Italian bees will not tolerate the wax moth, which is a great problem in the hive if allowed to get out of control.

In districts where there are a large number of wild colonies in the bush or there are very few commercial beekeepers the black bee is dominant. Italian bees in these areas quickly revert to the black, as the young queens generally mate with black drones. In such districts hives should be systematically requeened at least every two years with good, vigorous young Italian queens obtained from a reputable commercial queen breeder.

Causes of Swarming

The main causes of swarming are overcrowding of the brood nest, aged queens, oversupply of stores, lack of ventilation, too many drones, and changeable weather. By proper hive management and correct timing of all operations most of these causes of swarming can be avoided.

A very mild, early spring with a light honey flow causes an early build up in colony strength and the hives reach their peak long before the honey flow begins. During a period of bad weather, hives in this condition often start swarm cells, and when the weather improves swarms emerge.

Overcrowding of Brood Nest

The queen should be given ample room to expand the brood nest. During some spring months a considerable amount of nectar and pollen is gathered, and if the bees are not provided with extra room, they store this in the brood chamber round the brood nest, thus creating a barrier which curtails the laying of the queen. This condition can be relieved by removal of honey and pollen-clogged combs from the brood nest and replacement of them with good worker combs. An extra super of combs should be added above the brood nest into which the spare combs of honey and pollen may be placed, or they may be given to a weak hive which requires feeding.

At swarming time an unusual number of bees are secreting wax. This wax can be used for drawing out foundation combs. Where a few frames of foundation are placed within the supers at the correct time the swarming impulse may be suppressed or delayed until the main honey flow begins.

Too large a population of drones causes congestion of the brood nest and induces the bees to raise swarm cells. This development can be counteracted by removal of all combs with large patches of drone cells from the brood nest and replacement of them with good worker combs. Drone brood can also be destroyed by bruising the cappings of the cells with the hive tool.

Age of Queen

When colonies are headed by young, vigorous queens a correct rate of brood rearing can be maintained with less risk of the bees swarming. Under modern apiary management most queens are liable to fail in the spring of their third year when called on to lay a large number of eggs.

Unless these queens are replaced before they show signs of failing, there will be an increased tendency to swarming under the supersedure impulse. A failing queen can be recognised by her irregular brood pattern or the very slow build up of colony strength during spring.

Oversupply of Stores

Availability of too much honey from unused winter stores or from early spring nectar sources causes a rapid build up in spring and the hive reaches its peak strength too early. This is a cause of excessive swarming. Where this condition obtains beekeepers should reduce the amount of stores honey to only a few combs.

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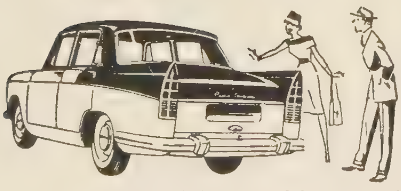

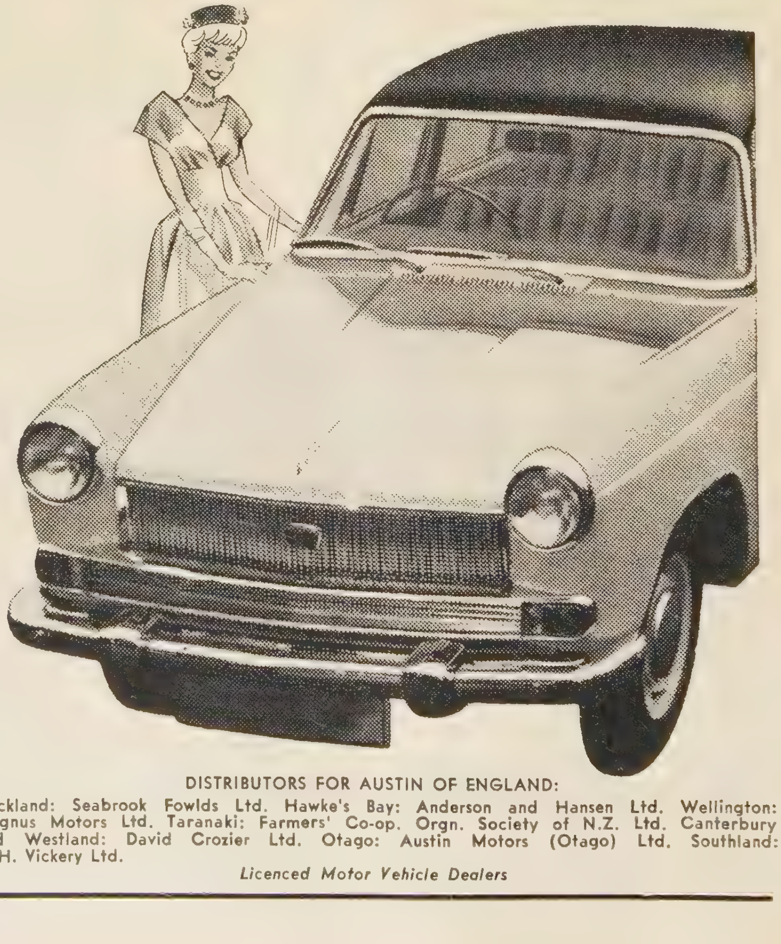

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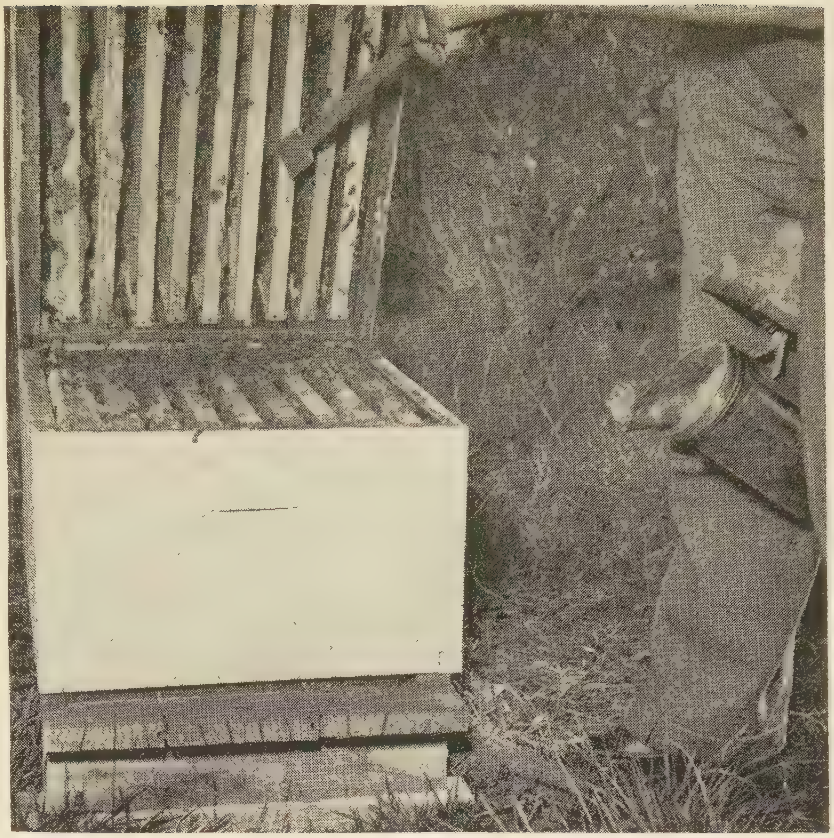

[Commercial Studios

Queen cells are invariably built along the bottom of the brood combs in the upper super. A quick check for their presence can be made by splitting the supers of the brood nest and tipping the top super back.

If necessary, the combs of honey which are removed can be returned to the hives later. This procedure holds the queen in check early in spring and regulates her egg laying until maximum brood rearing is necessary some six weeks before the main honey flow begins.

Proper Ventilation

As hives build up in strength and temperatures rise more ventilation may be required to keep hives at their correct temperature. Bees hanging in clusters at the hive entrance during a warm sunny day are an indication that the hive requires additional ventilation and may be raising queen cells.

Such hives should be checked and any queen cells that are found should be destroyed. Additional ventilation can be provided by placing one inch wedges in the front of the hive between the super and the bottom board. Care should be taken not to overdo this, as a sudden drop in temperatures may chill the hive and check brood rearing.

Prevention of Swarming

Once bees have developed the swarming fever, often only very drastic measures will prevent swarming. At the first signs of swarming, hives should be examined every eight or 10 days and all queen cells should be destroyed. All combs should be given a thorough examination, as it is easy to miss an occasional cell in an out-of-the-way corner. To assist in a quick and thorough examination, all combs should be given a light shake to remove most of the bees from the combs.

Before any queen cells are destroyed the hives should be examined to ensure that the queen cells present are not supersedure cells being raised to replace a failing queen. Swarm cells are usually very numerous and of different stages of development. Swarm cells are generally built along the bottom edge or side of the brood combs, whereas supersedure cells are few, usually of the same age, and are most often located on the face of a brood comb.

A quick method of checking a two-storied hive for queen cells is to split the brood nest and tip the top super back. If swarm cells are present, they will be seen along the bottom of the brood combs in the upper super.

Where queen cells have been started and increase is not desired some action must be taken quickly to prevent the bees swarming. Destruction of the queen cells, removal of two or three combs of brood from the brood nest and replacement of them with empty worker combs, and addition of an empty super of combs will prevent or delay swarming. The surplus combs of brood can be distributed to weak hives to give them a boost. Care should be taken not to give a weak hive too many of these combs, as in cold weather the bees may not be able to cover all the extra brood and it will die through chilling.

Exchanging Colonies

The exchange of weak colonies with strong ones at the first signs of swarming will do much to prevent swarming. In this way the strong colony loses its force of field bees when they return to the old hive site and the weaker colony is built up by the addition of these field bees.

Hives preparing to swarm can often be successfully requeened after three or four days when moved to a new location in the apiary or exchanged with a weaker hive. The old queen should be killed and a young one introduced in a cage placed between the middle combs of the brood nest. The hive is left for several days before being checked to see that the queen has emerged from the cage and has been accepted by the hive.

If the swarming fever persists and more drastic treatment is needed, the hive should be moved away several feet to a new place in the apiary and another bottom board and hive body placed on the old stand. A comb of brood on which is left one queen cell is removed from the parent hive with a comb or two of honey. These combs are then put into the new hive, which is filled up with worker combs.

By this method the parent hive is artificially swarmed, as the field bees which would otherwise have gone out in a swarm return to the old site and settle in the new hive. With this treatment both colonies will go to work with renewed vigour and usually will make no further preparation for swarming that season.

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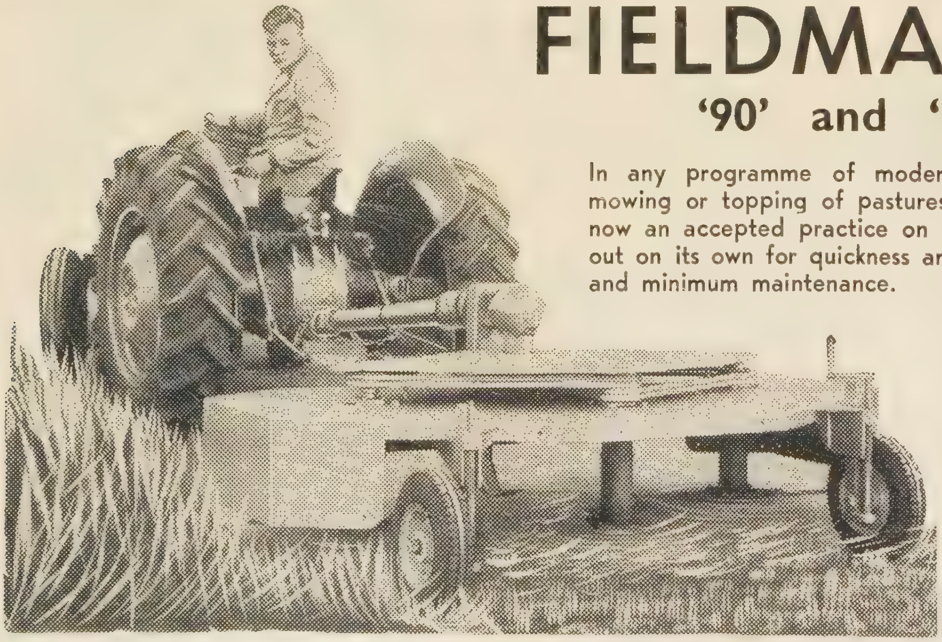

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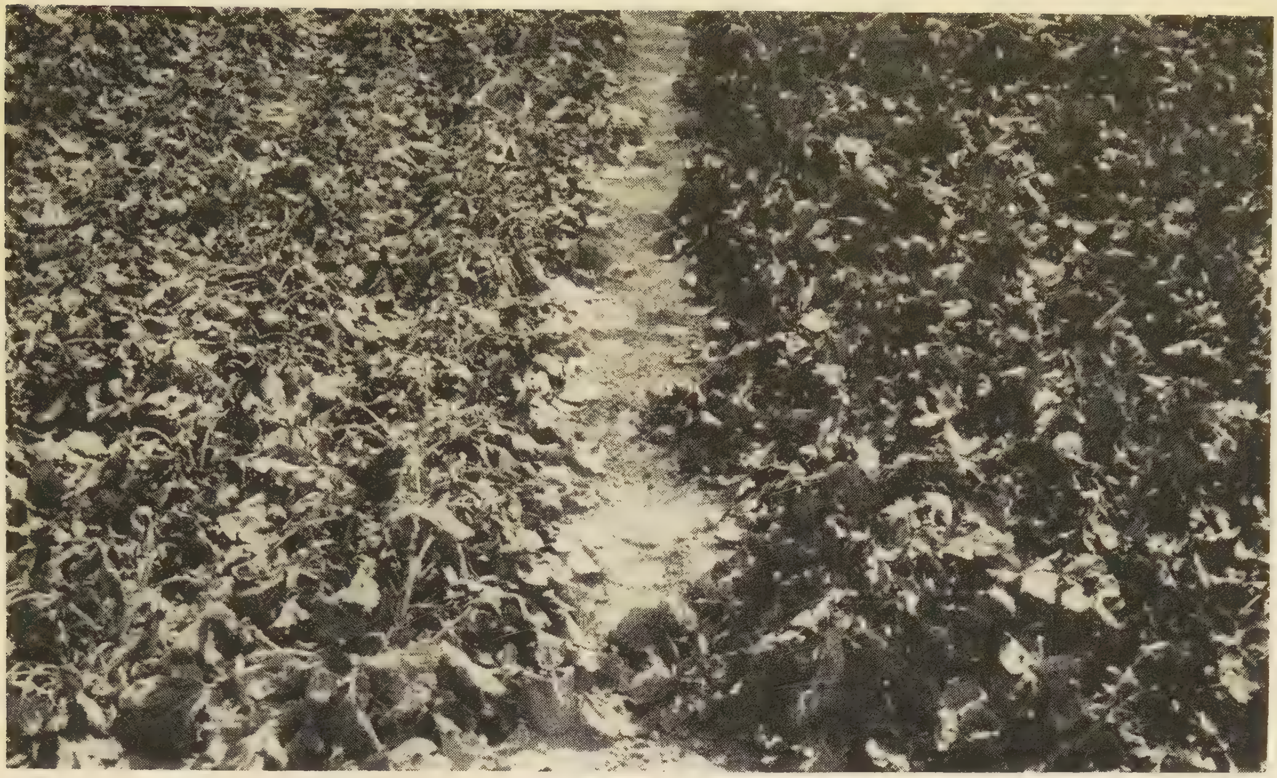
Aphis Resistant Rape



Broad Leaf Essex rape (left) suffering severely from aphid attack and Aphis Resistant (right) free from aphid attack at Lincoln in February.

RESULTS of trials of aphis resistant rape, which has been bred at the Crop Research Division, Department of Scientific and Industrial Research, Lincoln, are given in this article by T. P. PALMER, Senior Scientific Officer, Crop Research Division. A small quantity of certified seed is being made available this spring for sowing crops for feeding.

THROUGHOUT the rape-growing areas of Marlborough, Canterbury, and North Otago, and sometimes further south, cabbage aphids (*Brevicoryne brassicae*), also known as blight, often take a heavy toll of rape crops.

The rape crops are colonised by winged aphids, which fly in from other infested brassica crops on which they have spent the winter. They produce wingless young, which reach maturity in a few days and in turn produce wingless young. These summer generations breed rapidly and often pass unnoticed by the farmer until his crop is heavily infested. Heavy attacks cause rapid and severe loss of leaves from rape crops, and what is not destroyed becomes stinking and unpalatable. Attacks are usually worse in dry summers, when other lamb fattening feed is also in short supply.

As early as 1924 Dr F. W. Hilgendorf, of Canterbury Agricultural College, suggested that a "blight proof" rape might be an answer to this problem. Production of such an aphid resistant rape has been the main aim of the rape breeding programme at the Crop Research Division during the last 14 years.

None of the rapes we had when this work was started was resistant to aphids, but several varieties of swedes were known to be. Swedes and rape are often classified by botanists in the one species (*Brassica napus*), they are readily crossed, and the hybrids are fully fertile. From hybrids between resistant swedes and rape, rape-like forms, with the production and palatability of rape and the aphid resistance from the swedes, have been developed.

Breeding Procedure

The Aphis Resistant rape being released comes from the cross (Calder swede x Superlative swede) x Clubroot Resistant rape, Calder swede donating the aphid resistance to the hybrids.

This cross was made in 1946 by the late R. A. Calder, Director of the Crop Research Division, and the first selections for aphid resistance were taken in 1948 by C. M. Driver.

These early resistant selections were generally poor producers, and in their progeny many lines susceptible to aphids appeared. Selection since then has aimed at increasing and fixing the resistance to aphids; at increasing yields; and at eliminating obviously unsuitable lines, such as bolters which run to seed soon after sowing.

Selection for aphid resistance has presented no difficulties at Lincoln, as in almost every year a heavy aphid attack develops, and susceptible and resistant lines stand out quite distinctly. Selection for yield has not been so easy, because Broad Leaf Essex, with which the resistant rape must be compared for yield, was often destroyed by aphids before it was ready for harvest.

In the 1957-58 season and again in 1959-60, however, a series of yield trials in Canterbury remained free from aphids, and yield comparisons are available from these trials. These trials also gave some information on the relative palatability of the different selections. By 1959-60 the number of likely lines had been reduced to two, and the growth rates of lambs on these and Broad Leaf Essex were compared in two trials. The better of these lines was finally selected and will be distributed to farmers as Aphis Resistant rape.

Performance of Aphis Resistant Rape

Resistance

As its name implies, the most noteworthy feature of this rape is its aphid resistance. It has remained virtually free from aphids where adjoining plots of Broad Leaf Essex have been completely destroyed. An example of this difference is shown in the heading photograph on page 375, which is of plots of Broad Leaf Essex and Aphis Resistant grown at Lincoln this year. Ten plants of Broad Leaf Essex from some other plots at Lincoln averaged 1,200 aphids per plant on 15 February this year, while 10 plants of Aphis Resistant averaged only six. Differences of this sort have occurred at Lincoln over a number of years.

Aphis Resistant rape is not completely immune to aphid attack, and when repeatedly reinfested from nearby infested crops it can be severely damaged; it should not therefore be sown in mixtures with susceptible varieties.

Aphis Resistant rape is resistant only to the cabbage aphid. Two other aphids, the green peach aphid (*Myzus persicae*) and the false cabbage aphid (*Lipaphis erysimi*), sometimes cause damage in rape crops. Aphis Resistant rape is not resistant to these two aphids.

Aphis Resistant rape not exposed to repeated reinfestation by the cabbage aphid should remain free of heavy aphid attack; if it is constantly reinfested, it will remain free from damaging attacks much longer than will Broad Leaf Essex.

This freedom from aphids will have two main effects: it will allow a farmer to feed his rape crop to his lambs instead of to the aphids; it will permit him to feed his crop off when it and his lambs are ready instead of having to feed it before the aphids take too heavy a toll.

At flowering and afterward Aphis Resistant is not resistant to aphids, and seed crops will need the same treatment against aphid attack as other rape seed crops.

Yield

In 11 yield trials in 1957-58, mainly in Canterbury but with one at Invermay and one at Gore, Aphis Resistant produced about 20 per cent more dry matter per acre than Broad Leaf Essex. In a similar series of trials in 1959-60 it produced about 10 per cent less. More yield trials are needed, but those conducted so far indicate that the yield of Aphis Resistant is not greatly different from that of Broad Leaf Essex.

Virus Resistance and Second Growth

Club-root Resistant, Broad Leaf Essex, and Giant rapes often die right out, or are severely stunted, after a heavy aphid attack. Failure to recover is caused mainly by cauliflower mosaic virus. Aphis Resistant rape is much more resistant to this virus, and where other rapes may be severely affected by virus, Aphis Resistant will give a good amount of second growth. Where neither variety has been infected with virus, it gives as much second growth as Broad Leaf Essex.

Palatability

It has often been suggested that the introduction of aphid resistance into a rape variety would inevitably entail a lowering of the palatability. Trials have not supported this view. Many areas of Aphis Resistant rape were sown in farmers' fields of Broad Leaf Essex this year, and they were eaten equally readily.

Lamb Fattening Results

Two trials comparing the weight gain of lambs on Aphis Resistant and Broad Leaf Essex were conducted in 1959-60, one at Ashley Dene and the other at Lincoln College.

Owing to drought, the rape at Ashley Dene dried off early and lamb weight gains were below average on both varieties. Lambs were on the trial from 29 December to 27 January, with 36 lambs on each variety. Average weight gains were 6.4 lb on Broad Leaf Essex and 5.6 lb on Aphis Resistant. This difference was not statistically significant.

On the trial at the college 16 lambs were run on each variety from 7 January to 10 February. Lambs gained on an average 14.5 lb per head on Aphis Resistant and 11.2 lb on Broad Leaf Essex. This difference was significant. Heavy infestation with aphids on Broad Leaf Essex by the end of the feeding period may account for the difference.

Further lamb fattening trials are needed to give a more complete picture of lamb performance on Aphis Resistant rape, but the results from these two trials suggest that lambs do as well on it as on Broad Leaf Essex.

Establishment

Aphis Resistant has smaller seeds than other rapes on the market, the seed being distributed this year having a thousand seed weight of about 2.6 grammes, whereas a thousand seeds of a typical sample of Broad Leaf Essex weigh about 3.9 grammes. If Aphis Resistant is sown at the same rate as Broad Leaf Essex, more seeds will be sown and more plants established per acre. On clean ground in good condition for sowing, satisfactory crops should result from sowing at rates lower than normal.

As early growth of Aphis Resistant has not been as rapid as that of Broad Leaf Essex, it may be affected more than Broad Leaf Essex by weed competition on dirty ground. It is suggested, therefore, that on weed-infested ground, Aphis Resistant be sown at a seeding rate closer to that at which rape is normally sown on the farm.

After its slower start Aphis Resistant has usually caught up to Broad Leaf Essex and given comparable yields.

Appearance

Aphis Resistant has narrower leaves than Broad Leaf Essex or Giant rape and is more like Club-root Resistant rape in this respect. It is darker than Broad Leaf Essex and does not ripen so distinctly, though its colour changes noticeably when it matures.

Reaction to Clubroot

As far as is known this rape is susceptible to clubroot attack. Where clubroot is likely to affect rape adversely, it would still be wise to sow Club-root Resistant rape.

Distribution

A limited quantity of seed for sowing feed crops this spring is being distributed to seed merchants for supply to farmers, mainly in Canterbury, Marlborough, and North Otago, as these are the areas most liable to severe aphid attack. One purpose of this release is to allow farmers to form their own opinions of the merits of this rape, and to achieve this it is suggested that farmers obtaining Aphis Resistant rape seed should sow it in a block alongside a block of another rape variety for comparison of yielding ability and feeding value.

Conclusions

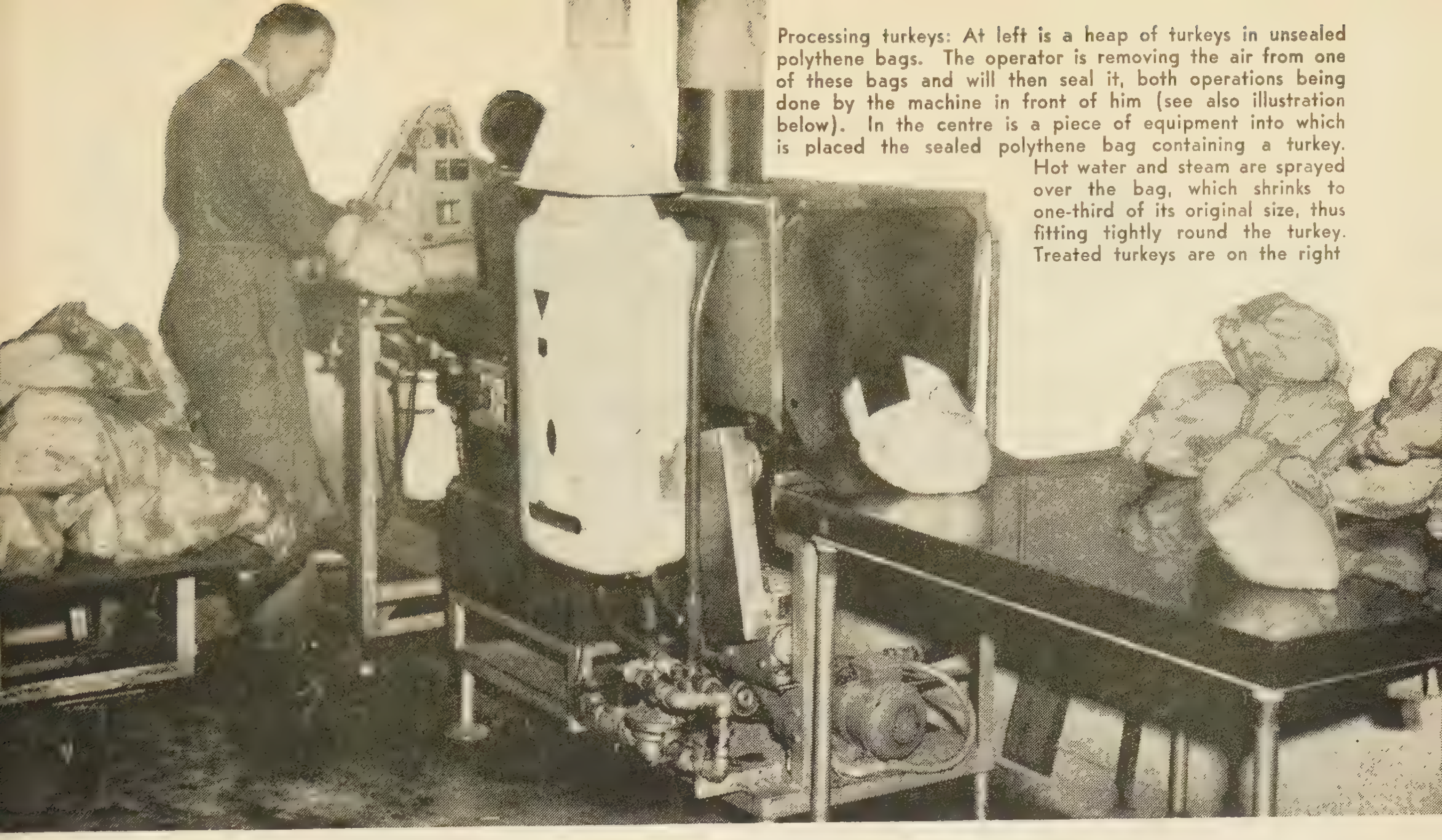
Aphis Resistant rape, with its substantial freedom from attack by aphids and associated viruses, should prove valuable to farmers in areas prone to aphid attack. When aphids have not been severe it has performed as well as Broad Leaf Essex, yielding as well, being equally palatable, and fattening lambs as well as Broad Leaf Essex. Where aphids have been severe on other varieties, it has remained clean and produced much more feed than other varieties.

Reference

Hilgendorf, F. W., "Farmers' Foes in New Zealand and How to Cope with Them", Whitcombe and Tombs Limited, 1924.

Acknowledgments

Thanks are due to farmers who provided land for trials, to Canterbury Agricultural College for providing land and sheep for trials, and to the Department of Agriculture for arranging for trials on farmers' properties and for conducting trials on their research stations.



Processing turkeys: At left is a heap of turkeys in unsealed polythene bags. The operator is removing the air from one of these bags and will then seal it, both operations being done by the machine in front of him (see also illustration below). In the centre is a piece of equipment into which is placed the sealed polythene bag containing a turkey. Hot water and steam are sprayed over the bag, which shrinks to one-third of its original size, thus fitting tightly round the turkey. Treated turkeys are on the right

Processing and Marketing of Turkeys

TURKEY raisers often give much time and thought to the production of prime turkeys, yet neglect to market their product attractively. This aspect cannot be over emphasised, as, except for orders to hotels and shipping companies, most turkeys are for Christmas consumption. This article completes the series on turkey breeding in New Zealand by J. H. Jones, Poultry Instructor, Department of Agriculture, Oamaru. Other articles appeared in the April, May, and September issues.

ANYONE contemplating turkey rearing on a commercial scale should ensure first that there is a profitable market for his product, and then arrange for the killing, plucking, dressing, packaging, and freezing of the carcasses, probably from June or July until December.

MARKETING

Selling Direct

If they have freezing space, growers near large towns or cities can kill, process, and sell direct to the customer. Though this system may involve considerable capital, organisation, and work, it results in a maximum profit. It cannot be recommended, however, for large commercial producers.

Selling on Contract

To sell on contract the grower arranges with a poultry firm to deliver turkeys at the firm's killing plant, the final price paid, either live or dead weight, depending on the condition, weight, and grade of the turkeys.

This system has much to commend it to the commercial grower, as he is aware during the rearing season of the approximate price he will receive, and is assured, assuming the birds are in good condition, of a sale for the entire flock. The heavy cost of dressing, freezing, and storing the birds is met by the merchant.

Regardless of system of marketing, however, the grower must present the birds in as good a condition as possible.

When handling the turkeys in the final stages and during the period of sales every effort must be made to avoid damage. Turkey flesh is easily bruised, mainly by rough handling during sorting at killing time.

After being plucked and trussed → the turkey is placed in a polythene bag. The operator has placed the turkey in a bag and the machine is withdrawing the air and sealing it.

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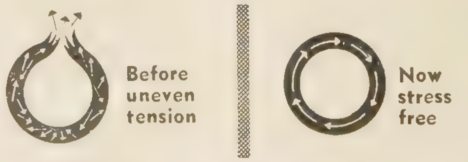

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If turkeys have to be caught during the day, it should be done cautiously and so as not to excite them, as they are liable to trample on each other and cause skin or flesh bruises. If turkeys are caught by the legs and jerked from the ground, the breast is often bruised and damage to both turkey and catcher may be caused by the flapping of the wings. Catching, sorting, and transporting turkeys from range to market are best done by driving, with the aid of a well trained dog, a small number at a time into a strongly built, wire cage about 7 or 8 ft high. As turkeys are excellent fliers, a wire roof is a great advantage.

Once in the cage the finished birds can be sorted out and packed on to sheep trucks, care being taken to keep the numbers in the divisions reasonably small, and so prevent crowding and bruising of the birds on their way to the processing plant.

PROCESSING

Preparation for Killing

Turkeys must be starved for 16 to 20 hours before killing to empty the crop and intestines, but they should be allowed plenty of drinking water. The final feed is usually given in the afternoon before killing day, but when large numbers are to be slaughtered they are best divided and the last for killing given a light feed in the early morning; otherwise they will lose weight rapidly.

No bird should be killed unless the crop is completely empty.

Killing

Faulty killing methods will result in flesh and skin discolouration with a lowering of market appearance. Turkeys can be killed by dislocation of the neck or by sticking with a knife and piercing the brain.

Dislocation Method

The dislocation method, which is suitable only for small turkeys, is simple and clean, but should be used only if the carcass is to be eaten immediately and not destined for cold storage.

Sticking and Debraining

The turkeys are killed by bleeding and piercing the brain, both operations being made through the mouth. The work should be done quietly and decisively. This system ensures proper drainage of the blood from all parts of the carcass. It also causes paralysis of all nerve centres, including the feather follicles, and this permits the easy removal of feathers even when dry plucked.

The bird, which is secured in a hanging position after being killed, is best left to flutter to assist the flow of blood from all parts of the body.

Plucking machine for turkeys. The turkeys are killed, bled, and semi-scalded, after which rubber fingers on a revolving drum rub off the feathers, except those of the tail and wings which are removed by hand.

When turkeys are hung for killing they are already in position for dry plucking if that system is to be used. Dry plucking, though somewhat slow and outdated, is recognised as a safe method of plucking to preserve appearances, bloom, and an unblemished carcass. In this country the semi-scald method of plucking is in general use in most commercial dressing plants and is used quite often in the home dressing of small numbers. It is much faster than the dry method and there is a lot less risk of skin tears.

The birds are first bled and when flapping has ceased are immersed and agitated for 30 seconds in water heated to 126 to 128 degrees F. They may then be plucked by hand or by mechanical pluckers, where rubber fingers revolving on a drum quickly remove the feathers.

The pin feathers or stubs are removed with a blunt stubbing knife. Great care must be taken to avoid staining or rubbing the skin during stubbing.

After the birds are plucked the next process is to clean or eviscerate the carcass. The method employed is similar to that used for preparing a roasting chicken, which is briefly as follows:

1. If the turkey has been dry plucked, it is singed with a flame to remove all hairs and fluff.

2. The legs and feet are removed, care being taken not to cut the flesh above the joint; otherwise when the bird is cooked the meat shrinks from the joint.

3. The head and neck is removed and with it the crop and windpipe.

4. The entrails are removed by first making an incision between the vent and the tail, looping the intestine and cutting out the vent. The abdominal fat and gizzard attachments are loosened and the whole of the viscera, with the heart and lungs, are removed by pulling on the gizzard.

The eviscerated carcass is then washed thoroughly inside and out, and cooled as rapidly as possible to a temperature of 32 degrees F or below, usually in tanks of iced water or slush ice. When all trace of body heat is gone the carcass is hung to drain before being trussed and packed in a plastic bag.

Thoroughly chilled and protected by the plastic from freezer burn, the birds are deep frozen until they are marketed.

Shrinkage in Weight in Processing

Loss in weight of the birds occurs from fasting or starving, plucking, cooling, and trussing. The greatest loss of weight occurs when trussing due to the removal of inedible parts or offal, which includes legs, head, blood, and the inedible viscera.

increasingly

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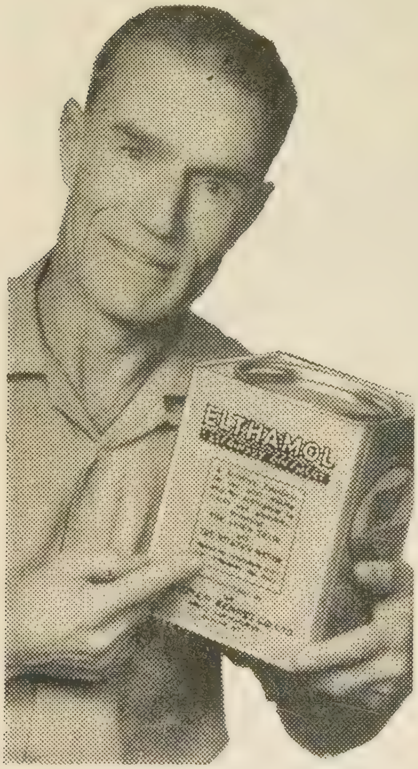

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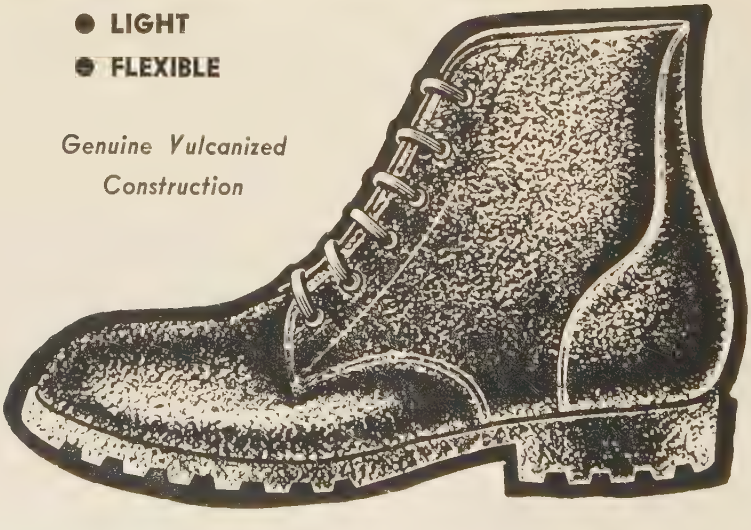

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A rack or section of trussed and bagged turkeys being put into deep freeze. Turkeys killed in May and June are held until the Christmas market about six months later.

Loss in Starving

For an average turkey ½ lb is lost in starving and this may be higher if the turkeys are starved for more than 24 hours or subject to fright or excessive travel or handling.

Plucking and Cooling

Weight losses for plucking and cooling depend on the efficiency of cooling (the quicker the cooling the less the loss):

½ to ¾ lb for small birds and
¾ to 1 lb for large birds

Trussing Losses

The loss in weight from the removal of inedible portions is approximately:

1¼ to 2 lb for small birds and
2¾ to 4¼ lb for large birds

On a percentage basis losses from killing and processing are obviously varied by the condition of the turkeys when killed, prime and finished birds losing proportionately less in trussing than immature birds.

When turkeys are trussed and ready for the oven a useful guide is to allow a quarter loss of live weight.

Can the Market for Turkeys be Expanded?

As previously stated the principal demand for turkey meat in this country is at Christmas. Turkey meat is looked on by most people as a luxury, too expensive for average occasions. If the turkey industry is to expand and prosper, it will be necessary to dispose of turkeys not only at Christmas but also at other times of the year. The increasing popularity of home freezers could assist the sale of turkeys, making them available for special family occasions throughout the year.

Promotion work by the industry and merchants will be necessary to build up these sales. If consumption is to be expanded noticeably, turkeys will have to compete with other meats in price and quality.

Whether the housewife buys a turkey instead of other meat will depend greatly on availability at the right time and whether the bird has the eye appeal through being well prepared for sale.

All photos by Photocraft Studios.

Book Review

"The Efficient Use of Fertilisers": Edited by V. Ignatieff and H. J. Page

THIS bulletin, a revised and enlarged edition, is based on the contributions of about 100 eminent agricultural experts representing all parts of the world except the Communist bloc. It attempts to explain the basic principles of both soil fertility and the general use of fertilisers.

The term "fertiliser" is used in a very wide sense. Thus organic manures including compost, sludge residues, night soil, and any other additive which may improve the productivity of the soil are discussed as well as the inorganic substances. There is special reference to the efficient handling and storage of these materials and there are also excellent tables giving the chemical composition of many manufactured and natural fertilisers.

The scope of the bulletin is rather heroic. This is well illustrated by the fact that three short chapters attempt to cover most of the factors which can be important in the use of fertilisers. They discuss the influence of soil type, crop rotation, soil texture, temperature, light and shade, irrigation, and drainage on fertiliser usage.

Much space is devoted to the placement of fertilisers and a very good summary of fertiliser placement trials carried out in England shares space with a discussion of deep placement of nitrogenous fertilisers for wet paddy in India and Ceylon. These three chapters contain much which will be new, even to specialists, drawing as they do their information from so many varied sources.

There is an interesting chapter on crop rotations which includes a section on green manuring, cover crops, and crop residues. The bulletin concludes with a discussion of soil regions of the world and with a summary of the soil and nutrient needs of important crops grown in cold temperatures and also in tropical countries.

The main weakness of the bulletin is its brevity. A very severe sifting and condensation of subject matter was necessary to present a world-wide picture of soil fertility principles and fertiliser in some 300 pages. This condensation has necessarily led to the over-simplification of some subjects and understandably to minor inaccuracies. Let us hope that FAO will be able one day to produce a much larger edition of this bulletin.—*C.D.*

FAO, Rome, 1958. 22s. 6d. New Zealand agents: Whitcombe and Tombs Ltd.

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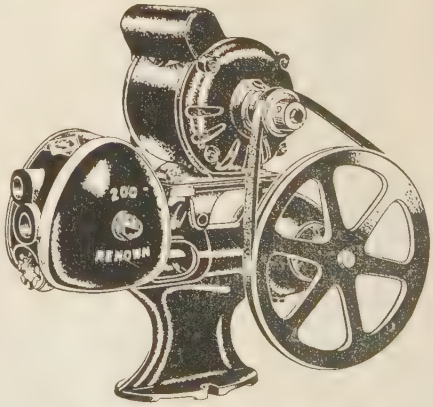

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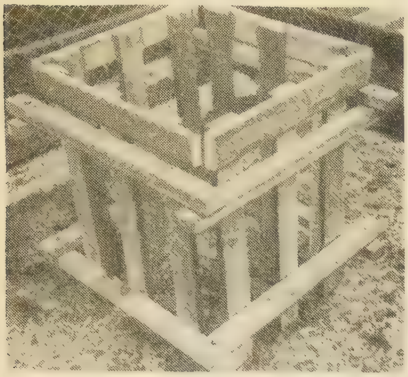
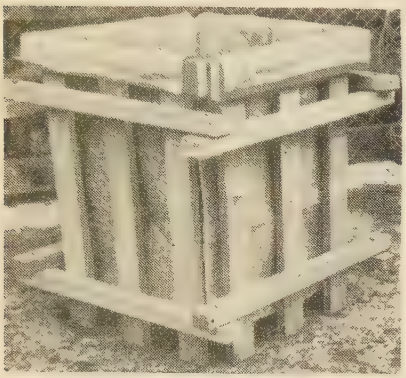
Inexpensive Home-made Wool Press

By G. L. WICKENDEN,

Sheep and Wool Instructor, Department of Agriculture, Wellington



The wool press assembled.



The bale in position in the press.

The wool press can be folded for storage when not in use.

THE wool press illustrated was made to handle the wool from 125 Romney ewes and hoggets shorn on Somes Island in 1958. The New Zealand standard wool pack, 27 in. x 27 in. x 42 in., was used and 36 skirted fleeces in nine tiers of four fleeces were heeled into a bale. Each bale weighed about 250 to 260 lb.

THE wool press was easily built and worked well. It could be used by small flock owners not having a commercial wool press and can be folded for storage when not in use.

Pressed bales can be taken out of the press by pulling out the top and bottom bolts on any corner of the press.

An overhead rope to hang on to would be useful to support the presser when he is heeling in the last few fleeces in the bale.

Materials

The materials used were:

4 in. x 1¼ in. Timber

Twelve 3 ft 4 in. lengths of 4 in. x 1¼ in. timber for sides.

Four 2 ft 5½ in. lengths of 4 in. x 1¼ in. timber (nailed flush with top of press to hold staples).

3 in. x 2 in. Timber

Eight 3 ft 3 in. lengths of 3 in. x 2 in. timber for cross supports.

Bolts

Eight 6 in. x ⅜ in. bolts.

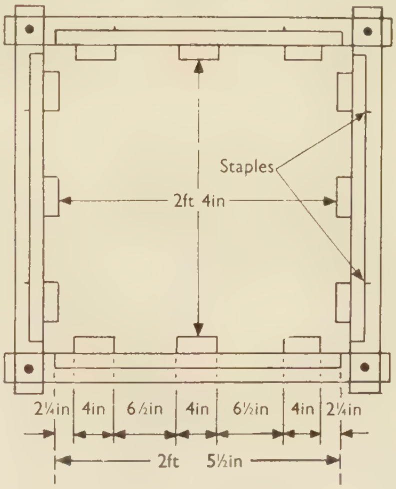
Eight large staples and nails (to hold woolpack in press).

The inside measurement of the press is 2 ft 4 in., which should be closely followed so that a neat bale is turned out.

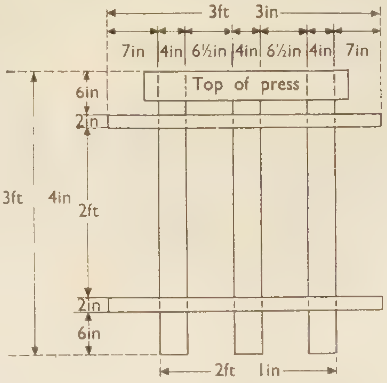
The 4 in. x 1¼ in. boards 3 ft 4 in. long nearest the corners of the press are 7 in. in from the ends of the 3 in. x 2 in. supports. The boards forming the sides are 6½ in. apart.

The 3 in. x 2 in. cross supports on two of the opposite sides are 6 in. from the top and 6 in. from the bottom and on the other two opposite sides 8 in. from the top and 8 in. from the bottom. The staples for holding the woolpack are 6 in. from each end of the 2 ft 5½ in. long boards which are nailed flush with the top of the press.

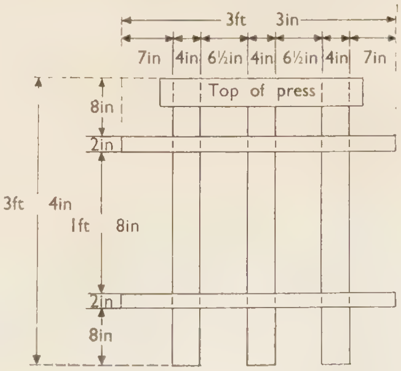
When the four sides are assembled and temporarily braced in the correct working position of the press, the holes for the 6 in. bolts can be bored in the 3 in. x 2 in. supports overlapping at the corners of the press.



Top of press.



▲ Two opposite sides of press. ▼



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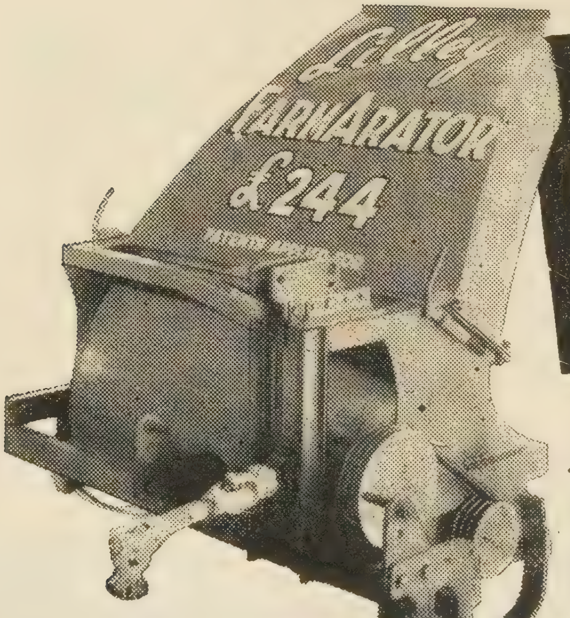

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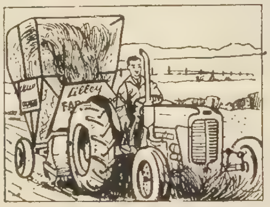
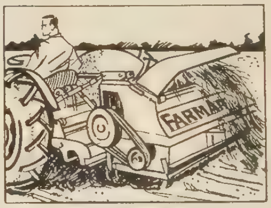


HARVESTS SILAGE



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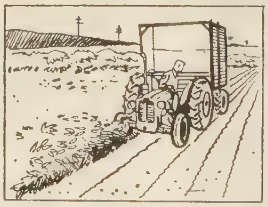

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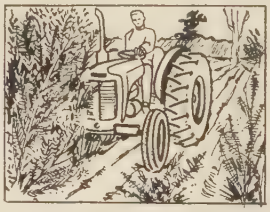

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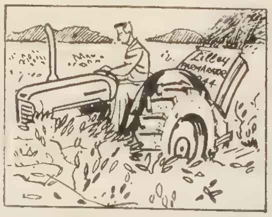
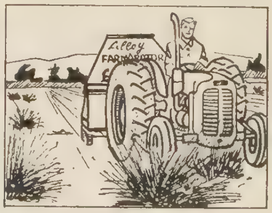


DESTROYS BLACKBERRY



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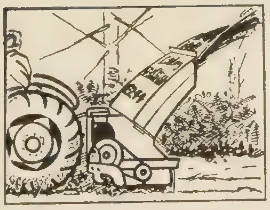

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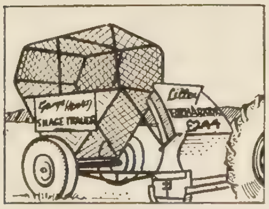

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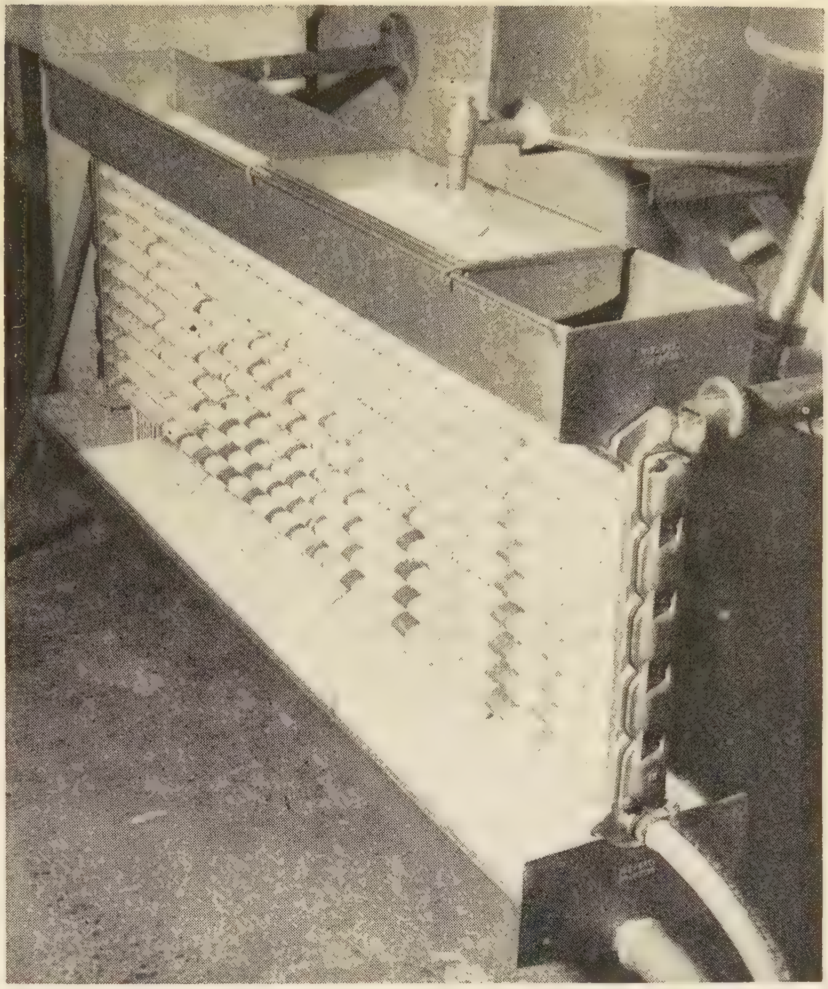
Efficient Milk Cooling at the Farm Dairy

TO obtain high quality dairy produce it is essential to cool the milk or cream effectively at the dairy immediately after milking. This article by M. J. McFetridge, Supervisor of Farm Dairy Instruction, Department of Agriculture, Hamilton, deals mainly with the cooling of milk, but the same principles apply to cream cooling.



MANY milk coolers at present installed in dairies are capable of much more effective cooling, but through faulty installation or poor management or both their efficiency is seriously reduced.

Water for cooling is usually drawn from bores, wells, streams, or dams. Stored water from dams is generally unsuitable because of its high temperature during summer. For the same reason streams are not usually satisfactory and careful checking of the temperature should be made before deciding to use water from such sources. Wells are usually fairly good, as the temperature changes in well water are not as great as in streams, but there is some risk of pollution from surface drainage. Moreover the quantity available is sometimes restricted, particularly in seepage or shallow wells.

Bore Supply Best

On the whole bores are the most satisfactory source of cooling water, as both temperature and volume available are fairly consistent throughout the year. However, they should be close to the milking shed, the water being pumped direct from the bore through the cooler.

To comply with the Dairy Produce Regulations milk must be cooled so that its temperature on delivery at the manufacturing dairy does not exceed 65 degrees F. To meet this requirement the temperature of water for cooling should not exceed 60 degrees. An efficient water cooler can reduce the temperature of milk to within 3 degrees of the inlet water temperature. To do this a ratio of 3 gallons of water to 1 gallon of milk is usually required, though under good conditions a ratio of 2 : 1 may give good results. In town supply dairies with mechanical chilling the aim should be to obtain maximum results in the primary (water) cooling section, as it is much more economical to reduce the temperature by water cooling than by refrigeration.

Balancing Vat

The efficiency of the cooler itself will be improved considerably by the installation of a balancing or control vat. Correct adjustment of the outlet tap will ensure an even flow of milk over the cooler during the whole milking. The rate of milk flow from the releaser varies considerably during milking, depending on the type of milking shed, the breed of cow, and shed management.

Recent investigation into this question showed, to quote two typical instances, that with a Jersey herd milked by two milkers with a 4-cow doubled-up machine the rate of flow of milk over the cooler varied from a maximum of 60 gallons per hour to a minimum of 30 gallons per hour. Under similar circumstances with a Friesian herd the maximum flow was 109 gallons per hour and the minimum 49 gallons per hour. This means that the average rate of flow at the first dairy was 45 gallons per hour and at the second 79 gallons per hour.

To handle varying rates such as these efficiently some form of control is essential and the installation of a control vat is an economical and effective means of doing this. The installation of a control vat at the second dairy quoted was responsible for lowering the temperature of the bulk milk from 70 degrees to 64 degrees—a reduction of 6 degrees with no other alteration to the system.

A shallow control vat 6 or 7 in. high to hold 10 or 12 gallons of milk and fitted with a ⅜ in. tap is easily installed and is all that is required to give satisfactory control for up to four doubled-up machines. Slightly larger vats may be required for larger herds. The shallow vat has the advantage that there is a more uniform head of milk. Furthermore the cooler itself can be installed at a greater height from the floor, which should reduce spillage on the floor and wall.

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'100' '500' '1500'

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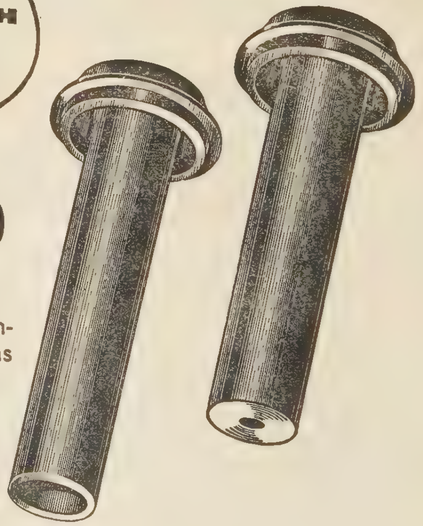

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The water must be led in at the bottom of the cooler and out at the top. A very important point in cooler installations is that there must be no restriction in the outlet connections. Too many sharp bends, forcing the water to high overhead tanks, or having long reticulation systems coupled to the cooler outlet cause friction losses with a consequent reduction in the flow of water through the cooler. Likewise any reduction in piping size or improvised rubber hose of smaller bore reduces the quantity through the tubes. Use of the outlet water from the cooler for udder and teat washing has much to commend it, but a bypass must be provided to discharge the water when it is not required for udder washing.

Keep Cooler Tubes Clean

Water used for cooling may have a heavy mineral content which in time will form a scale inside the tubes and seriously affect the efficiency of the cooler. A heavy deposit of milkstone forming on the outside also has a detrimental effect on the unit. Cooler tubes should therefore be kept clean and free of deposits both inside and out. Modern coolers have detachable headers, which can be removed for inspection and cleaning of tubes.

To obtain a uniform flow over the whole of the surface the cooler must be level and the holes in the top tray of correct size and evenly spaced. Investigations have been made by manufacturers into the question of spacing and size of holes required to handle the rated capacity of their particular products. If the design is altered materially, either by enlarging or filling holes, the efficiency of the cooler will be reduced.

Effect of Pump Speed

With the increased use of pumping equipment to carry milk away from the bottom tray of the cooler, attention should be given to the operating speed of the pump. This should be only fast enough to keep the outlet from the tray covered with milk, thus avoiding the drawing in of warm air with the milk and so raising the temperature. Under such circumstances high fat content milk tends to churn. In hot weather temperature rises of from 4 to 6 degrees are common where attention has not been given to this matter. To control the speed of the pump either the driving pulley should be changed or an adjustable pulley fitted.

With the trend toward tanker collection of milk and away from home separation to whole milk supply, the installation of cooling equipment and the provision of other facilities connected with milk cooling have become very important. Mixing of inadequately cooled milk with milk that has been cooled effectively can lower the quality of a whole tanker load. Unsatisfactory cooling and poor equipment in the dairy could result in the partial churning of the milk and loss to the producer.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of April 1961.

NORTH ISLAND

*14 and 15 October—Poverty Bay A. and P. at Gisborne.
18, 19, and 20 October—Hawke's Bay A. and P. at Hastings.
27, 28, and 29 October—Waikato A. and P. at Hamilton.
28 and 29 October—Wairarapa and East Coast P. and A. at Carterton.

November

2 November—Cambridge A. and P. at Cambridge.
*4 and 5 November—Manawatu and West Coast A. and P. at Palmerston North.
5 November—Tokoroa A. and P. at Tokoroa.
11 and 12 November—Wanganui A. and P. at Wanganui.
11 and 12 November—Whangarei A. and P. at Whangarei.
12 November—Clevedon A. and P. at Clevedon.
*16 November—Thames Valley A., P., and H. at Te Aroha.
18 and 19 November—Egmont A. and P. at Hawera.
*19 November—Waihi A. and P. at Waihi.
19 November—Rotorua A. and P. at Rotorua.
19 November—Bay of Islands P. and I. at Waimate North.
*25 and 26 November—Auckland A. and P. at Epsom, Auckland.
25 and 26 November—Stratford A. and P. at Stratford.
30 November—The Plains A. and P. at Ngatea.

December

*3 December—Kaikohe A., P., and H. at Kaikohe.
3 December—Hauraki A. and P. at Paeroa.
3 December—Helensville A. and P. at Helensville.
*10 December—Whangaroa A. and P. at Kaeo.

January 1961

2 January—Nuhaka A. and P. at Nuhaka.
14 January—Central Hawke's Bay A. and P. at Waipukurau.
20 and 21 January—Feilding I., A., and P. at Feilding.
20 and 21 January—Wairoa County A. and P. at Wairoa.
*27 and 28 January—Horowhenua A. and P. at Levin.
28 January—Galatea A. and P. at Galatea.

February

*1 February—Marton District A. and P. at Marton.
3 and 4 February—Rodney A. and P. at Warkworth.
*4 February—Rangitikei A. and P. (Golden Jubilee) at Taihape.
4 February—Woodville A. and P. at Woodville.
4 February—Katikati A. and P. at Katikati.
*7 and 8 February—Dannevirke District A. and P. at Dannevirke.
8 February—Te Awamutu A., P., and H. at Te Awamutu.
10 and 11 February—Taranaki A. and P. at New Plymouth.
10 and 11 February—Taumarunui District A. and P. at Taumarunui.
11 February—Hukerunui A. and P. at Hukerunui.
11 February—Tauranga A. and P. at Tauranga.
11 February—Pahiatua A. and P. at Pahiatua.
16 February—Matamata A. and P. at Matamata.
17 and 18 February—Franklin A. and P. at Pukekohe.
*18 February—Waiapu A. and P. at Ruatoria.
18 February—Te Puke A. and P. at Te Puke.
18 February—Northern Wairoa A. and P. at Mititai.
24 and 25 February—Wellington and Hutt Valley A. and P. at Trentham.
24 and 25 February—Te Kuiti and District A. and P. at Te Kuiti.
25 February—Mangonui County A. and P. at Kaitaia.
*25 February—Whakatane A. and P. at Whakatane.
25 February—Waimarino A. and P. (Golden Jubilee) at Raetihi.
25 February—Putaruru District A. and P. at Putaruru.

March

*1 March—Morrinsville A. and P. at Morrinsville.
4 March—Opotiki A. and P. at Opotiki.
11 March—Kumeu District A. and H. at Kumeu.
18 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

15 October—Ellesmere A. and P. at Leeston.
22 October—Northern A. and P. at Rangiora.
*29 October—Motueka A. and P. at Motueka.
29 October—Ashburton A. and P. at Ashburton.
29 October—Amberley A. and P. at Amberley.

November

4 and 5 November—Marlborough A. and P. at Blenheim.
*9, 10, and 11 November—Canterbury A. and P. at Christchurch (Royal Show).
12 November—Tokomairiro A. and P. at Milton.
16 November—North Otago A. and P. at Oamaru.
18 and 19 November—Nelson A. and P. at Richmond.
19 November—West Otago A. and P. at Kelso.
19 November—Courtenay A. and P. at Kirwee.
*19 November—Waimate A. and P. at Waimate.
19 November—Taieri A. and P. at Outram (Centennial Show).
*22 and 23 November—Timaru A. and P. at Timaru.
26 November—South Otago A. and P. at Balclutha.

December

3 December—Otago Peninsula A. and P. at Portobello.
3 December—Winton A. and P. at Winton.
*6 and 7 December—Gore A. and P. at Gore.
10 December—Wyndham A. and P. at Wyndham.
*16 and 17 December—Southland A. and P. at Invercargill.

January 1961

*21 January—Waiau A. and P. at Tuatapere.
21 January—Peninsula Horse and A. and P. at Duvauchelle.
24 and 25 January—Otago A. and P. at Dunedin.
28 January—Banks Peninsula A. and P. at Little River.
28 January—Palmerston and Waihemo A. and P. at Palmerston.

February

18 February—Murchison A. and P. at Murchison.
25 February—Kaikoura A. and P. at Kaikoura.
25 February—Buller A. and P. at Westport.

March

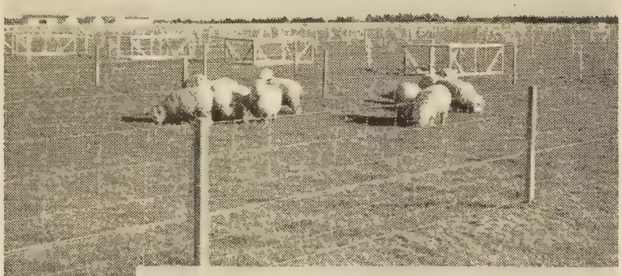
*4 March—Rai Valley A. and P. at Rai Valley.
4 March—Amuri A. and P. at Rotherham.
11 March—Mayfield A. and P. at Mayfield.
*11 March—Mt. Benger A. and P. at Roxburgh.
18 March—Hawarden A. and P. at Hawarden.
*18 March—Upper Clutha A. and P. at Wanaka.
*25 March—Methven A. and P. at Methven.

April

3 April—Strath-Taieri A. and P. at Middlemarch.
3 April—Mackenzie Highland Show at Fairlie.
*15 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

Recent Research Work



SEASONAL VARIATIONS IN PASTURE IRRIGATION

ANNUAL pasture production at the Department of Agriculture's Winchmore Irrigation Research Station is more than doubled by border dike irrigating whenever half the available soil moisture is used up. With this method of frequent irrigation a high producing sward of perennial ryegrass and white clover can be maintained under sheep grazing as long as an adequate rate of superphosphate is applied.

NEVERTHELESS it might not always be advantageous to aim for maximum production all the year round. It might, for instance, not be desirable to force production in midsummer if stock requirements are restricted, because most lambs have been fattened and the ewes are to be kept fit but lean. Herbage produced during a dry midsummer is costly because so much irrigation water is required to keep the soil moisture level up when temperatures, and therefore transpiration, are at a peak. A trial was begun at Winchmore at the beginning of the 1957-58 season to investigate the effects and after effects of withholding irrigation at different times of the year.

DESCRIPTION OF TRIAL

THE trial was laid down on a border diked sheep pasture sown in March 1957 with 20 lb per acre of perennial ryegrass, 10 lb per acre of short-rotation ryegrass, 3 lb per acre each of cocksfoot, timothy, and Montgomery red clover, and 2 lb per acre of white clover.

The following three treatments are being compared:

1. Irrigation from September to the end of April, if required. No dry spell.
2. Irrigation from September to mid December and from mid February to the end of April. No irrigation for two months in midsummer.
3. Irrigation from mid December to the end of the season. No irrigation during the first three and half months of the season.

Each treatment was replicated five times and rotationally grazed. Separate flocks of ewe hoggets were used to avoid any transference of fertility from the irrigated to the dry pasture. The stocking rate was adjusted so that the level of grazing was similar for all treatments; sheep grazing days and liveweight gains were recorded in addition to dry matter production. For the last purpose three enclosure frames per plot were mown at three to four weekly intervals. Pasture composition was determined by herbage dissection of mown samples.

RAINFALL AND IRRIGATION

In the mid Canterbury irrigation schemes irrigation water is available from September to April inclusive. Table 1 gives rainfall figures over the irrigation seasons. April has been excluded, as the chances that irrigation would be required during that month are fairly remote.

TABLE 1—RAINFALL IN INCHES

Year	1 September-15 December	16 December-15 February	16 February-31 March	Total 1 September-31 March
1957-58	9.0	7.4	3.6	20.0
1958-59	6.7	2.4	8.7	17.8
1959-60	6.9	2.2	3.0	12.1
10 year mean (1949-50 to 1959-60) ..	9.8	4.8	4.6	19.2

During the first two seasons irrigation was applied whenever the soil moisture level came down to 20 per cent (about 60 per cent available soil moisture). This level was reduced to 15 per cent (about 30 per cent available soil moisture) for the third irrigation season. The numbers of irrigations for the three seasons are shown in Table 2.

TABLE 2—NUMBER OF IRRIGATIONS

	1 September-15 December Treatment			16 December-15 February Treatment			16 February-31 March Treatment			Total 1 September-31 March Treatment		
Year	1	2	3	1	2	3	1	2	3	1	2	3
1957-58 ..	4	4	—	4	—	5	2	3	2	10	7	7
1958-59 ..	5	5	—	6	—	6	2	2	2	13	7	8
1959-60 ..	3	3	—	3	—	4	1	2	1	7	5	5

No prolonged dry spell was recorded during the 1957-58 season. In spring and summer of 1958-59, however, soil moisture levels dropped well below wilting point for about four weeks on both partially dry treatments. Similarly soil moisture levels were again well below wilting point for over three weeks in both spring and summer of 1959-60.

RESULTS

TABLE 3—DRY MATTER PRODUCTION IN LB PER ACRE

Treatment	1957-58	1958-59	1959-60
1	7,720	9,310	12,010
2	7,050	6,970	9,960
3	6,420	7,440	9,870

The seasonal growth is shown in Table 4, in which treatments 2 and 3 are compared with treatment 1 on a percentage basis.

TABLE 4—SEASONAL PRODUCTION, TREATMENT 1 = 100

	Spring (Sept.-Nov.)			Summer (Dec.-Feb.)			Autumn (March-May)		
Treatment	1957	1958	1959	1957	1958	1959	1957	1958	1959
1	100	100	100	100	100	100	100	100	100
2	95	105	95	85	35	57	103	108	109
3	70	66	57	83	82	98	104	104	105

CONCLUSIONS

1. Growth was retarded during the periods that irrigation was withheld. The severity of the drop in production depended on the soil moisture deficit.
2. Within two to three weeks after irrigation was resumed, the production recovered to the level of pastures continually irrigated.
3. White clover did not recover completely from the dry spell in midsummer of 1959-60 and the pasture therefore opened up to a small extent.
4. Temporary boosts in production were recorded more than four weeks after irrigation was reapplied. These boosts were mainly due to the encouragement of perennial ryegrass.
5. Results of total sheep grazing days and liveweight gains show that the utilisation of the feed on the pastures irrigated for only part of the season was at least as good as that on the pastures irrigated throughout the season.

—*J. LAMMERINK,*

Scientific Officer, Department of Agriculture Irrigation Research Station, Winchmore

The second article in a series by J. F. FILMER, formerly Director, Animal Research Division, Department of Agriculture, Wellington, the first of which, "Butterfat per Acre", was published last month.

VACCINATION

A Summing up of Research

VACCINATION is now so commonplace that is has become a routine operation on most New Zealand farms. There is no doubt that it has markedly reduced losses from infectious diseases and so increased the efficiency of animal production. It seems likely, however, that the results would be even better if the principles underlying vaccination were more thoroughly understood. This article explains those principles and indicates how they should be applied.

IT is well known that a dog which has had an attack of distemper as a puppy seldom contracts the disease again even though it comes into contact with infected dogs. This is because the very complex defence mechanism of the body has been stimulated by the original attack. Anti-bodies against distemper virus are produced and the concentration of these in the blood increases to reach the maximum level about three to four weeks after infection. By this time in a mild attack they are able to neutralise the virus in the body and the dog recovers. The concentration of the anti-bodies in the blood then gradually falls, but the defence mechanism, having once been stimulated, remains on the alert, and if distemper virus again enters the body, anti-bodies are produced extremely rapidly and the virus is neutralised before it can cause any harm.

This mechanism has been used to protect dogs against distemper by vaccination. The first step was to

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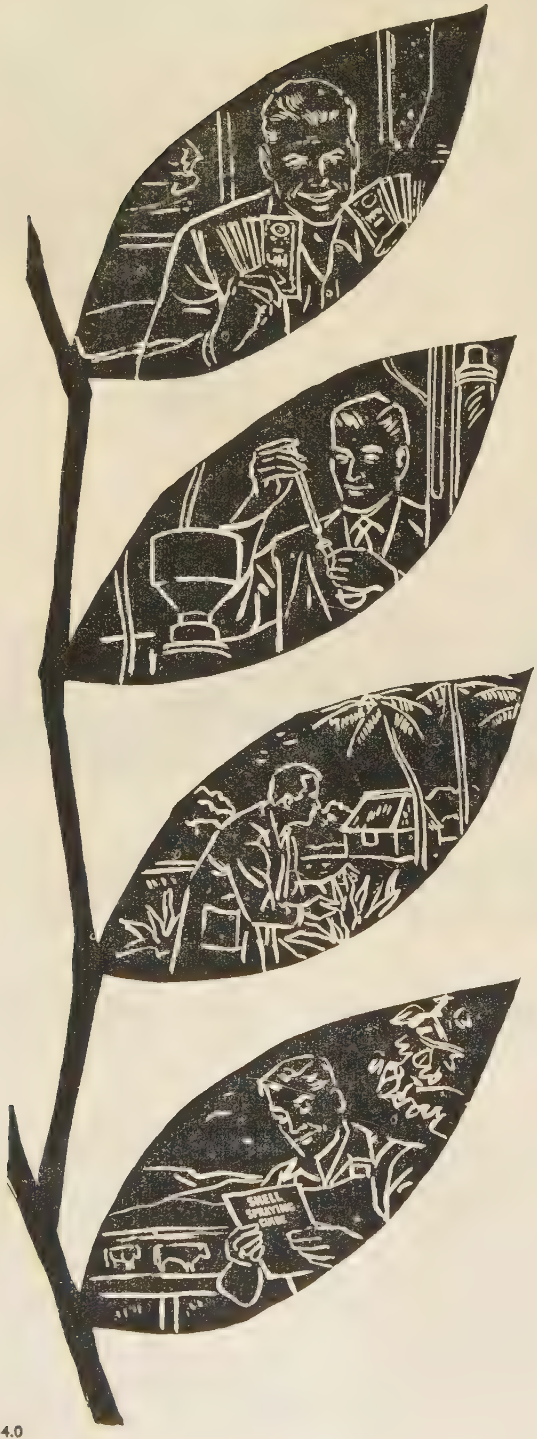

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isolate the virus which caused the disease and to show that distemper could be produced by injecting it into puppies which had not previously been infected with distemper. When such puppies were again injected with the virus they did not become infected. The next step was to find a way of making dogs immune to distemper without exposing them to the risk of serious illness or even death which may result from an attack of distemper, whether this is contracted naturally or from injection of the virus.

Several methods of doing this have been devised. The one most commonly used in New Zealand is to reduce the virulence of the virus by growing it on the developing chick embryo. The virus treated in this way loses its power to produce distemper when injected into dogs, but still provokes the formation of anti-bodies, thus rendering the dog immune to distemper.

This over-simplified account of the production of a distemper vaccine can be used as a pattern to illustrate the principles involved in the practice of vaccination. In brief they may be summarised as follows:

1. Usually vaccination is effective only against diseases in which immunity follows recovery from a natural attack. A number of diseases such as mastitis in cows and foot rot in sheep do not follow this pattern, and vaccines are much less likely to be effective against them.
2. Vaccines are prepared by isolating the germ or virus which produces the disease and treating it in such a way as to reduce or eliminate its virulence without impairing its immunising properties.
3. Vaccines are used for preventing diseases, not for curing them. To be effective they must be given in time to allow the defence mechanism of the body to be stimulated before the animal is exposed to infection. This period may vary in different diseases, but is seldom less than 10 days.

The manufacture of vaccines in New Zealand is strictly controlled by the Stock Remedies Board. The premises and the technician must be registered and the vaccines must be made to a standard stipulated by the Board. Farmers can therefore buy vaccines with an assurance that they are of good quality. However, to obtain good results from them it is imperative that they should be properly used. To ensure this the makers' instructions must be followed scrupulously.

Some vaccines which require special care in handling are supplied only to veterinary surgeons and Livestock Instructors. Others may be purchased and used by farmers, but it must not be assumed that no care is required in handling these. Abscesses and even blood poisoning and death can be caused by the introduction of infectious organisms by the syringe.

All the vaccines sold in New Zealand can be relied on to give reasonable protection, but none of them will give absolute protection against massive doses of infective organisms. Reasonable hygiene must therefore not be neglected. No vaccine is likely to protect a pregnant cow against contagious abortion if she is allowed to eat the afterbirth of a cow which has just aborted. Such cows should be isolated until discharges cease and the dead calf, the afterbirth, and any discharge which can be found should be burnt or treated with a reliable disinfectant and deeply buried.

Precautions

THE following precautions should always be taken in using vaccines:

Never vaccinate in dusty yards. A temporary yard erected in clean pasture is often the safest place, though clean sheds or yards (with a sealed surface) are usually satisfactory.

Never vaccinate wet sheep.

Always boil the syringe before use.

Change needles frequently and keep them in methylated spirit when not in use.

Make sure that the vaccine is placed just under the skin and not into the muscle.

Discard any vaccine that is left in an opened bottle at the end of the day.

Vaccination against blood poisoning in sheep provokes a very strong immunity, but it may not be adequate if lambs are marked in dirty yards in which the dust is highly contaminated with the germs which cause the disease.

Full instructions are issued by the makers with all vaccines sold. A few points in regard to some of the vaccines being used in New Zealand need emphasis.

Pulpy Kidney Vaccine

In the past vaccination against pulpy kidney has not been particularly successful. Improvements over the past few years, however, should make the latest vaccines more effective.

Pulpy kidney is caused by a germ which is often present in the small bowel of lambs without causing any harm. Under certain conditions which are not at all well defined this germ multiplies very rapidly and the toxin produced by it is absorbed and kills the lamb. Frequently this happens in very young lambs.

The defence mechanism of very young animals is usually not well developed and it is often impossible to provoke an active immunity in them by vaccination. Fortunately they can be protected in other ways. Anti-bodies which are circulating in the blood of a pregnant ewe are concentrated in the colostrum or first milk and are taken in by the lamb when it suckles. It must be realised that in this process the lamb itself does not produce any anti-bodies and it is therefore essential that it should obtain the biggest dose possible from the ewe. To enable it to do this timing of vaccination is very important. A high concentration of anti-bodies in the colostrum will occur only if there is a high concentration in the blood of the ewe at lambing. This can be obtained by vaccinating the ewe twice. The first vaccination alerts the defence mechanism and the second, which should be done about 10 days before lambing commences, causes a rapid production of anti-bodies.

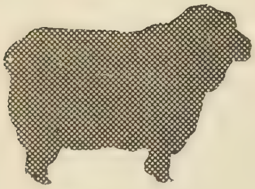
Where pulpy kidney occurs regularly in very young lambs the most effective practice is to vaccinate two-tooth ewes at about tupping and then again as close to lambing as possible.

Older ewes which have been vaccinated before will need only the pre-lambing vaccination. In all cases this must be timed correctly. If it is more than a month before lambing, it will not be very effective. This may mean that early and late lambers will need to be vaccinated separately.

It is important to remember that the passive immunity which the lamb obtains from colostrum will last for only about six weeks. If pulpy kidney is likely to occur in lambs after this age, they must be vaccinated themselves. In such cases probably the best practice is to mark early and vaccinate then and a second time about a month later.

One of the great difficulties in protecting lambs against pulpy kidney is the very irregular occurrence of the disease. It may strike with devastating suddenness when least expected. In such cases it is too late to obtain protection by vaccination.

Fortunately there is a method of protection which can be used. When a horse or other animal is injected with repeated and increasing doses of pulpy kidney vaccine a high concentration of anti-bodies develops in its blood. After removing the blood cells the serum from such animals can be used for



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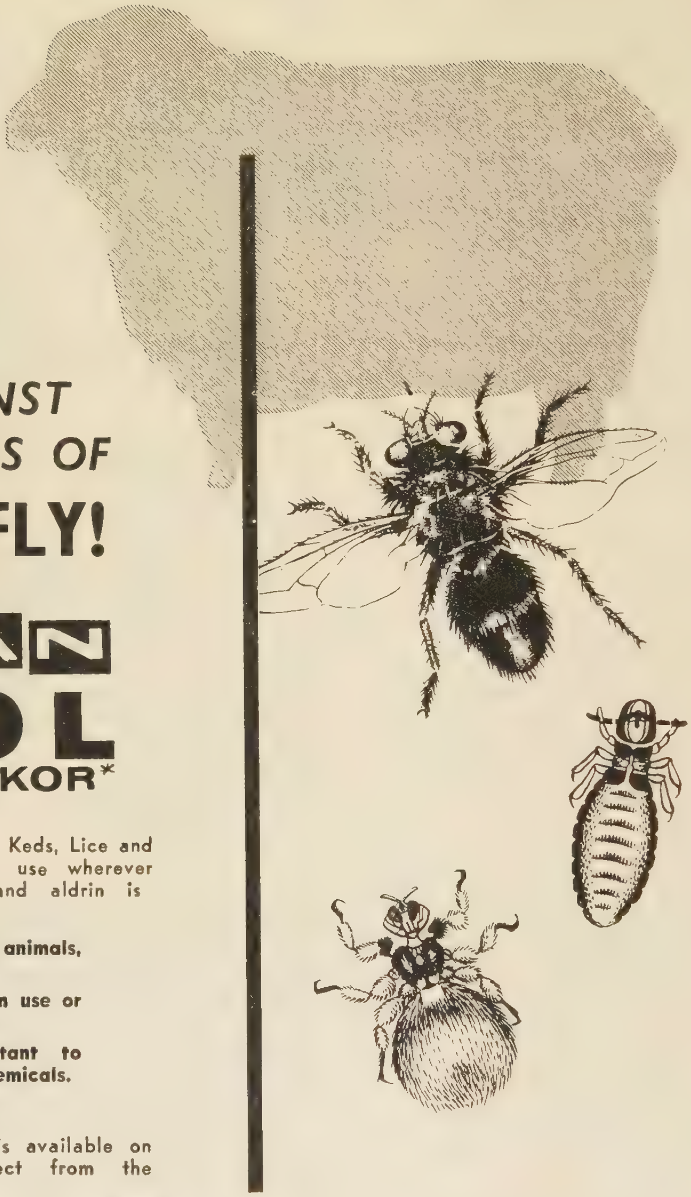

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supplying anti-bodies to lambs which are exposed to infection. It is possible in this way to give immediate but short-lived immunity and thus prevent the development of a serious outbreak. To do this, serum must be administered to all lambs in the flock as soon as deaths from pulpy kidney are recognised.

Blood Poisoning in Sheep

During the last decade blood poisoning in sheep has become increasingly prevalent. It is usually due to infection of wounds with the blackleg organism, but sometimes another related organism is involved, acting either alone or in association with the blackleg organism.

The germs which cause this disease live in soil, particularly in the presence of blood and other forms of organic matter. Once they become established in a paddock sheep with any form of wound are liable to become infected. It is therefore not surprising that major outbreaks have occurred in ewes after lambing, in new-born lambs, in lambs after marking, in hoggets grazing swedes (through mouth infection), in newly shorn sheep, and through infection of needle punctures where vaccination has been carried out without proper precautions.

Work at the Department of Agriculture's Wallaceville Animal Research Station resulted in the production of a very potent vaccine against blood poisoning, and the vaccines commonly used in New Zealand are based on this work. However, good results will be obtained only if vaccination is done intelligently. Vaccination must be carried out at least 10 days before sheep are exposed to infection in any of the situations listed above. Protection of new-born lambs and marked lambs can be given only through the ewe as in the case of pulpy kidney. In this case only the pre-lambing vaccination is necessary, but the same care must be taken in timing. In addition it is advisable to mark early while anti-bodies obtained from colostrum are still present in the lamb.

It must be remembered that immunity is specific and applies only to the organism against which the vaccine has been prepared. Pulpy kidney vaccine will not protect against blackleg and vice versa. It is therefore necessary to have the cause of death correctly diagnosed to ensure that the appropriate vaccine is used.

It is now possible to obtain vaccines prepared from mixtures of organisms which are effective against several diseases. In some cases these are very useful, but it is still wise to seek veterinary advice on the cause of death so that the most appropriate vaccine can be used and used at the proper times.

Black Disease in Sheep

Black disease in sheep is caused by an organism which invades the liver through injuries caused by young liver flukes. Its distribution in New Zealand is rather limited and it is absolutely essential that a correct diagnosis be obtained. Where this has been done the disease can be prevented by the use of the appropriate vaccine in November or early December, as the disease occurs mainly in summer and autumn.

Scabby Mouth

Scabby mouth disease is caused by a virus which infects superficial scratches on the lips of lambs and occasionally on their legs. It may be transferred by the lambs to the udders of ewes. This is not a fatal disease and usually clears up in a few weeks without treatment. However, it can seriously retard the growth of lambs and make it difficult to get them fat early.

Scabby mouth is not fatal, but it can seriously retard the growth of lambs. One dose of the vaccine will give a long immunity.

The vaccine is made from dried live virus and it is very important that the manufacturers' instructions are carefully followed. In particular any vaccine remaining in an opened bottle should not be kept for future use.

The best time to vaccinate is at marking. One dose will give a long immunity and it is therefore not usually necessary to vaccinate older sheep. However, it is often wise to vaccinate newly purchased ewes, as they may not be immune and can contract the disease from infected lambs. They should be vaccinated at the same time as the lambs.

As human beings can be infected with this disease, precautions should be taken against infection either from diseased lambs or from the vaccine.

Epididymitis

The cause of epididymitis disease was determined at Wallaceville and a very effective method of vaccination was also evolved there. Because of the special nature of the vaccines used they are sold only to veterinary surgeons, who are aware of the precautions necessary.

Young rams should be vaccinated after they reach the age of four months and not less than two months before they are placed with the ewes.

It is important to keep weaned ram lambs from contact with older sheep to prevent infection before vaccination.

Older rams can be vaccinated, but it must be realised that vaccination will not cure rams which are already infected. Sheep farmers would be well advised to buy only young rams which have been vaccinated.

Strain 19 Vaccine

Strain 19 vaccine was developed in the United States of America and was used there for the first time in 1925. The organism used is a strain of the one which causes contagious abortion in cattle, but it has been so greatly reduced in virulence that it may be safely injected alive.

American workers in a large series of experiments found that when heifer calves were vaccinated with this strain they resisted infection with virulent strains when pregnant and very few abortions occurred.

In 1941 Strain 19 vaccine was adopted as part of the national plan for the control of contagious abortion in the U.S.A. In the same year the Strain 19 organism was imported into New Zealand and experiments with it started. In 1943 large-scale field trials were begun, no charge being made for vaccination on condition that dairy farmers kept accurate records of all abortions. Vaccination rapidly became popular as shown by the following figures of calves vaccinated:

1943	18,000
1944	40,000
1945	110,000
1946	160,000

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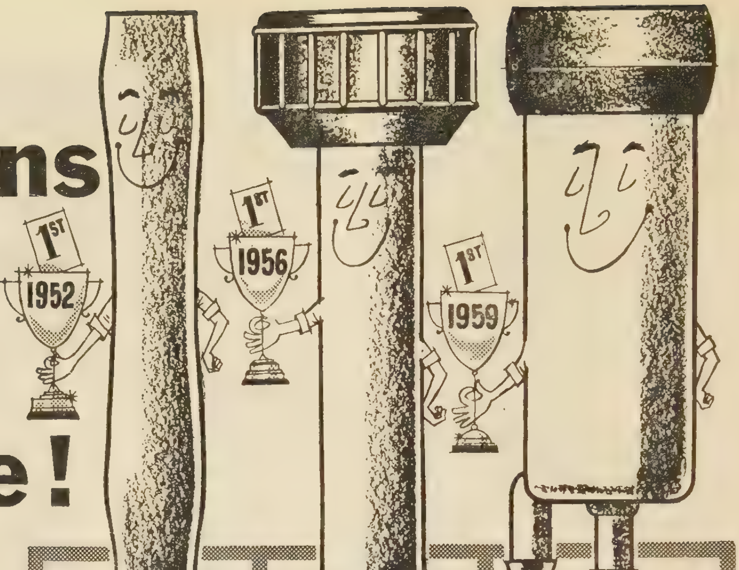

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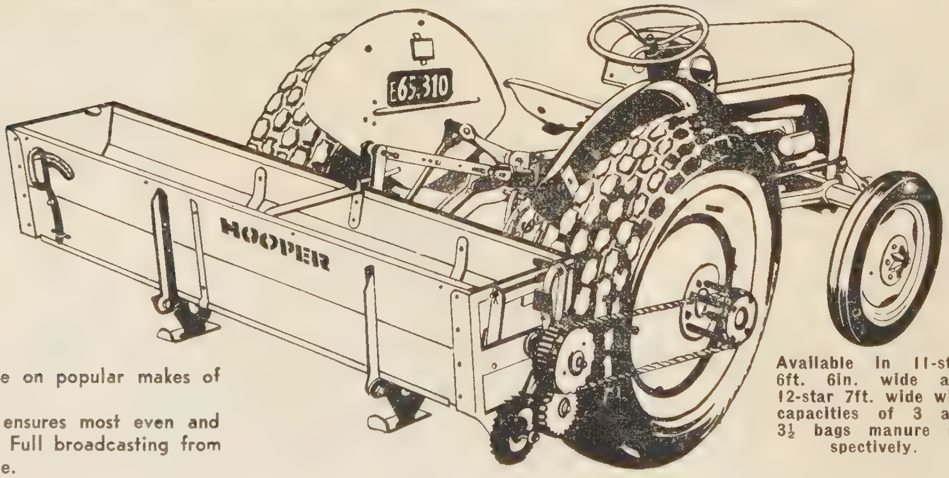

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The results were excellent. In 1945 only 2.6 per cent of abortions from all causes occurred in 16,075 two-year-old vaccinated heifers in 1,266 herds compared with 22.3 per cent in non-vaccinated heifers in the same herds during the previous year.

Results have continued to be good. In 1955 a Dairy Board survey showed that only a little over 3 per cent of abortions from all causes occurred in vaccinated two-year-old heifers. It was, however, disappointing to find that vaccination was not being practised in 12 per cent of herds.

Because vaccination has greatly reduced the incidence of contagious abortion, pregnant cows are not now exposed to nearly the same risk of infection that existed in 1943. Consequently abortions even in non-vaccinated heifers now average only about 4.8 per cent. It is probably for this reason that some farmers do not vaccinate. However, this may prove to be false economy. The introduction of infection into an unprotected herd could easily start a disastrous abortion storm.

Contagious abortion can be just as serious in beef herds as in dairy herds. Vaccination with Strain 19 has brought about a spectacular increase in the effective calving rate in many beef herds, and its wide use in these herds can be thoroughly recommended.

Because it contains living bacteria, Strain 19 vaccine is available only to veterinarians and Livestock Instructors, who are responsible for its proper use. Farmers can collaborate by making sure that all heifer calves are vaccinated at the right age. They should not be younger than four months or poor immunity may result, and they should be vaccinated before service. Beef heifers which are not mated until they are two years old are best vaccinated as yearlings. Experience in New Zealand and overseas indicates that one vaccination produces an adequate lifetime immunity and re-vaccination is seldom necessary.

Summary

Vaccination is a powerful tool for controlling and preventing infectious diseases, but optimum results will not be obtained unless certain principles are observed. The most important of these are:

1. **An accurate diagnosis is essential so that the appropriate vaccine can be used.**
2. **The manufacturers' instructions must be followed scrupulously and particular care must be taken to vaccinate at the right time and to observe proper precautions.**
3. **No vaccine will confer an absolute immunity and stock must therefore be protected against infection by proper measures of hygiene and segregation.**

Vaccination of heifers against contagious abortion is sound business, because many in-calf heifers that slip at five months never come in milk at all.

Leptospirosis

Redwater in calves due to infection with leptospira causes heavy losses. Work at Wallaceville has shown that this can be prevented by vaccinating the cows early in pregnancy and again two to four weeks before calving. The anti-bodies formed in the vaccinated cows are concentrated in the colostrum and it is of course essential that the calf should obtain this during the first few days of its life. If cows have not been vaccinated, calves can be protected if they are given hyperimmune serum as soon as the first case of red-water is detected. Though the length of this immunity is limited, it is usually long enough to abort an outbreak.

In New Zealand leptospirosis has caused abortion in cows and it is likely that vaccination will be effective in controlling this also.

Scours in Calves

Scouring in calves is often due to infection. No vaccine is available in New Zealand for controlling this condition, but there is good evidence to indicate that a measure of protection is conferred through the colostrum. It is therefore important that all calves should be allowed to suckle their dam for the first few days or should be fed colostrum that has been taken from a newly calved cow. It is not necessary that this should be from the calf's own dam.

Johne's Disease

Though Johne's disease does not usually manifest itself in young cows, there is evidence to show that infection generally occurs in the young calf. Promising results have been obtained from vaccinating the calves at an early age. Johne's disease has also appeared in sheep on a few properties in the South Island and vaccination is being tried there.

Fowl Pox

Three vaccines, all of which contain living virus, are available against fowl pox. Pigeon pox vaccine is useful during an outbreak for protecting birds which have been in contact with infected birds. A special pigeon pox vaccine is used on day-old chicks to prevent outbreaks during the brooder stage. Immunity given by this vaccine lasts only about three months.

Fowl pox vaccine gives a lifelong immunity, but it cannot be used on young chicks or adult birds. When properly used on birds between eight to 12 weeks of age the results are excellent. It can be purchased only on the authority of a Poultry Instructor. Poultry farmers who experience trouble with fowl pox should consult the nearest Poultry Instructor who will advise on the best preventative measures both in regard to hygiene and a vaccination programme.

Infectious Laryngo-tracheitis (I.L.T.)

Infectious laryngo-tracheitis disease of poultry was diagnosed in New Zealand for the first time in 1957, but it is almost certain that it had been present for a considerable time before that. In flocks where the disease occurs it can be controlled by vaccinating all growing stock when the youngest birds have reached six weeks of age. The vaccine is a live one and is handled by Departmental officers, as its use is not without risk.

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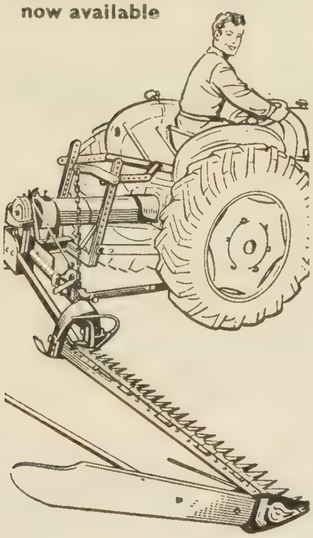

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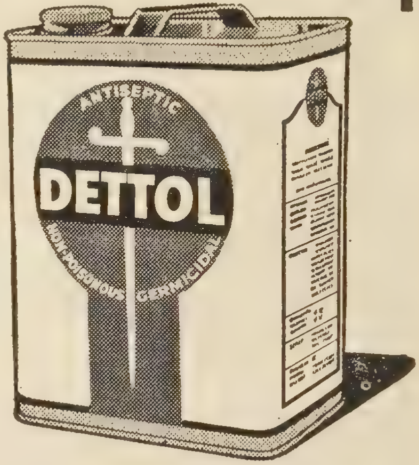

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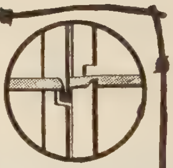

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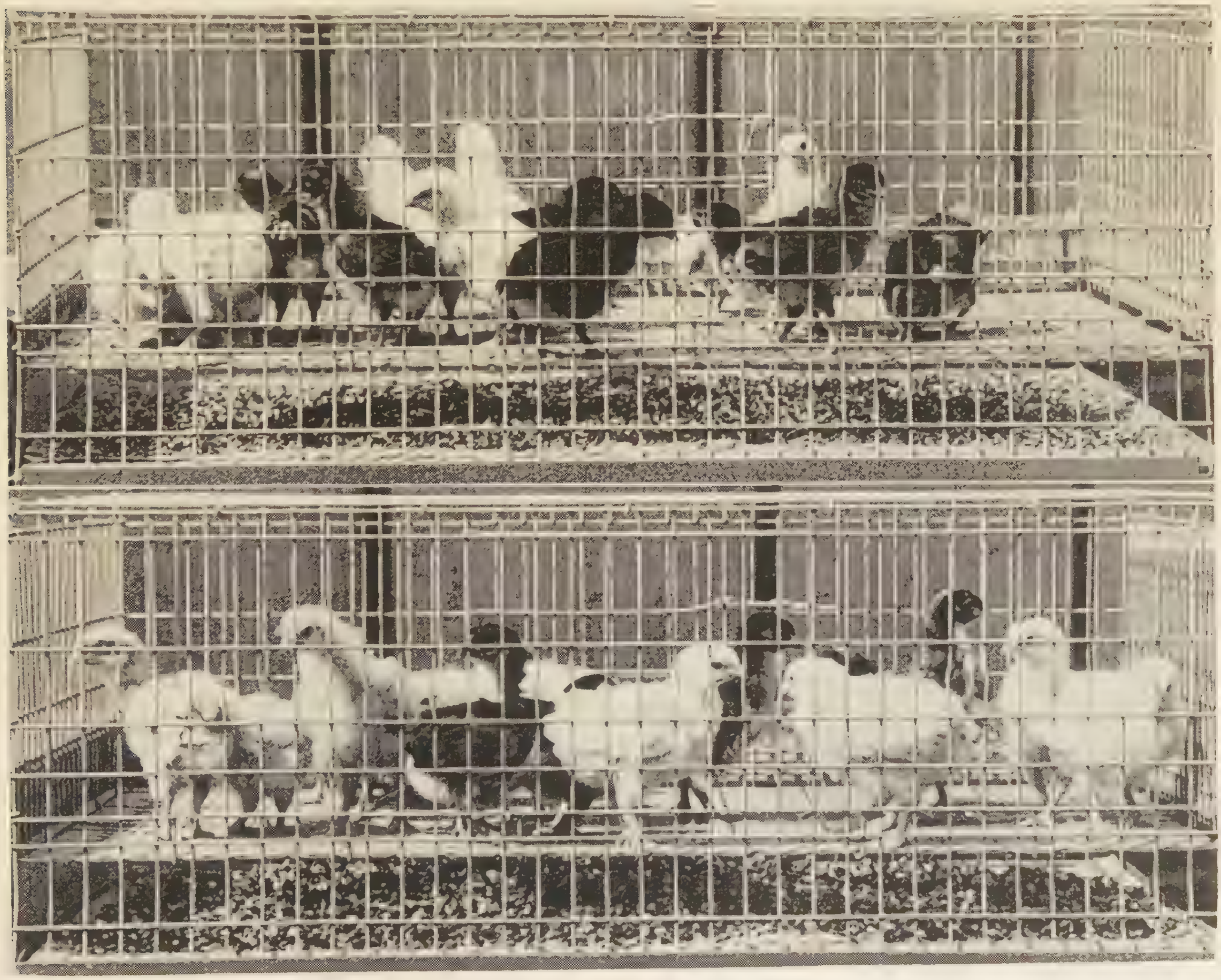
Experiments to Develop Test for Poultry Feeds

SUCCESSFUL raising of chickens and production of eggs depend on many factors of management. One of these is certainly the quality of the feed given to the birds at all stages. Many different feeding programmes may be used and it is part of the art of the poultryman to know how to balance all the different products to the needs of his birds at different times. Experiments during the past year at the Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, to develop a method of using young chicks to assess the quality of different mashes are discussed in this article by JEAN G. MILLER, Senior Scientific Officer, Wellington, and J. EDMONDSON, Poultry Experimentalist, Upper Hutt, both of the Department of Agriculture.

HOWEVER skilful and experienced a poultryman may be, he cannot expect to get consistently good results if the commercial product that he buys this month is of different quality from the same product bought the previous month. This has too often been the unfortunate situation in the poultry industry. Variations in quality in the same product can occur through changes in the quality of the raw materials used, such as the grain, or through poor mixing of the ingredients. This can be serious with materials like vitamins and minerals that are used in small quantities; if a batch is poorly mixed, some bags may get an oversupply while the amount in others is quite inadequate.

The Department is anxious that there should be some testing scheme available to manufacturers so that they can maintain consistent products and thus give the service to the industry that they would wish. Chemical tests



Marked variation in growth in two groups of chicks receiving low-protein mash (upper cage) and normal protein control mash (lower cage).

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of mashes give only a part of the picture and it is often difficult to know what they mean in terms of the quality of mash as a food. The quality of a mash depends on the performance of the birds to which it is being fed. The best test will be one which measures just this.

Questions Examined

Questions examined during the investigation included:

1. What kind of equipment should be used?

It was obviously not feasible to try out a great many types and sizes of cages to find out the best, and fortunately the first kind tried proved very suitable.

A set of six cages each to contain about 25 chicks was set up in a 16 ft x 14 ft room of an open-fronted, lean-to type poultry house. Each cage is an individual unit set on a 27 in. high stand and measures 35 x 22 x 10½ in. high, with a small electric heater suspended from the top of the cage. Movable food and water troughs are fixed outside the cage and are raised as the chicks grow.

After the first test, in which seven out of the eight deaths that occurred were the result of cannibalism, sunlight was prevented from falling directly on the cages and ventilation was improved. Cannibalism occurred again in the second test, but was less severe, with no fatality. In all further tests the tip of the upper part of the beak was removed from each chick when it was five days old.

Chicks for the tests were produced from crossbred pullets (housed in single-bird laying cages) which are artificially inseminated with pooled semen from 12 males.

We were able to show that the position of the cages in the rooms, whether at the front or the back, did not have any effect on the growth of the chicks.

2. How many chickens have to be used in every test?

This depends on how variable the chickens are and how accurately the difference between feeds needs to be measured.

By wing banding and weighing all the chickens separately we were able to find out how much they varied from one to another in their growth, even when they were all given the same mash. When we decide what differences in quality are important to poultry keepers we will be able to use this information to calculate how many chickens we need for every test. At present it appears that about 50 chicks will have to be put on each mash every time it is tested.

3. How long should each test last?

The younger the chickens are the more susceptible they are likely to be to diet deficiencies, and therefore with very young chicks the more likely we are to be able to detect small differences in quality. On the other hand a certain time must be allowed for the deficiencies to become apparent. Tests will be upset if there are many deaths due to causes apart from the feeds. As the heaviest chance mortality occurred in the first few days, it has been decided not to begin tests until five days after hatching.

In all the trials the chicks were fed only coarse ground grain from hatching until the fifth day. This reduces the food nutrient reserve carried through from the maternal diet and this practice will probably be followed in the routine tests. On the fifth day the undersized and weakly chicks were removed and the others divided up for allocation to the cages, where they then received the test diets.

Our experiments have shown that a three weekly test period is best and this will be a very convenient one. In all the experiments, which were run from the fifth to the twenty-sixth day, there were very few deaths after the cannibalism trouble had been overcome.

4. How sensitive will the chickens be to quality differences?

Having tested all the chickens in different cages on a control mash we tried mashes with different degrees of deficiency. The first test mash was very low in protein. The control and the test mashes were made up as follows:

	Control lb	Test lb
Bran	5	5
Pollard	10	10
Wheat meal	50	50
Maize meal	10	10
Meat meal	12	*6
Milk powder	6	—
Oyster dust . ..	1½	1½
Salt (manganesed) ..	½	½
Vitamin premix	1	1
Lucerne meal	4	4

* Half meat meal, half bone meal.

There was no doubt about the difference in the growth of the chicks.

	Grammes
Average weight gain per chick on control mash	201
Average weight gain per chick on test mash	79

The difference was very clear in the appearance of the chicks, though no definite symptoms developed in the test chicks. They just did not appear to be doing well. (The difference between the two sets of chicks can be seen in the illustration on page 397.)

This was a very extreme difference in quality, so the next experiments compared mashes that were only slightly different. The mashes were the same as the control mash in the previous experiment except that a different meat meal was used for each. The test was done twice and results were:

Weight gain per chick on:	1st test grammes	2nd test grammes
Mash A	131	136
Mash B	179	157
Difference	48	21

Though the size of the difference was larger in the first trial than in the second, the superiority of mash B over mash A was statistically significant in each case. Thus the technique was able to detect the difference in quality due to just one ingredient in a mash.

From these trials it is clear that a simple test service could be set up to measure the quality of chick feeds to whatever accuracy was thought desirable.

There are still a few more questions to be answered by experiment before such a routine service is made available to the industry. Work on these points should be completed in the next few months.

Testing of Mashes for Laying Birds

It is much more difficult to establish a test for a laying mash. No test which took account of the eggs laid would be of use, as it would take far too long to complete and the batch of the material being tested would be used up before the results were available. But any quick test of quality that is used must **give the same answers** as would a full laying test.

It is hoped that the growth of young chicks will prove a good index of the quality of laying mashes as well as of chick mashes. Experiments are under way now to see if this is so, and results to date are encouraging. However, to ascertain whether laying mashes can be checked by the measurement of growth in young chickens will take a considerable time.

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Grafting Passionfruit Vines

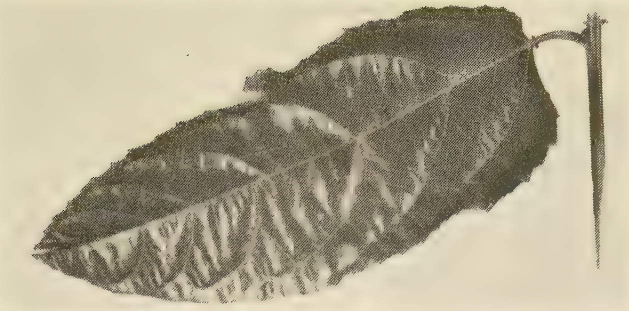
Fig. 1—Scion suitable for outdoor grafting.

By G. W. J. BLACKER,
Fruit Research Division, Department of Scientific
and Industrial Research, Auckland

ROOT and collar rot of passionfruit vines in the Te Puke district is becoming an ever increasing problem. In Queensland, where a similar disease exists, growers are being advised to plant vines of purple passionfruit grafted on golden passionfruit stock which is resistant to a *Fusarium* fungus causing the disease (1). Investigations on the organisms responsible for death of vines in New Zealand are incomplete, but several fungi, including species of *Fusarium*, appear to be involved (2). If the golden passion vine is resistant to these, the use of grafted plants on this stock would aid in preventing the disease. Glasshouse and orchard trials are in progress to determine this.

GRAFTED plants on golden passion vine stock have been raised at the Fruit Research Division, Department of Scientific and Industrial Research, Auckland, and a trial planting of these to test disease resistance, growth, and cropping has been made at Te Puke in cooperation with officers of the Horticulture Division, Department of Agriculture. The Horticulture Division has also distributed seed of the golden passionfruit to growers.

The following information based on experience at Fruit Research Division is presented to aid growers who may wish to propagate their own grafted plants.

Golden Passionfruit

The golden passionfruit (*Passiflora edulis* var. *flavicarpa*) is a botanical variety of the purple passionfruit. It is commonly grown in subtropical climates and is the main type grown commercially in Hawaii. The vine resembles the common passionfruit but is distinctive in appearance, the stems, leaf veins, and young growth having a purplish tinge.

We have not seen mature vines, but the flower is said to be somewhat less showy than that of the purple passionfruit and the fruit is larger, yellow

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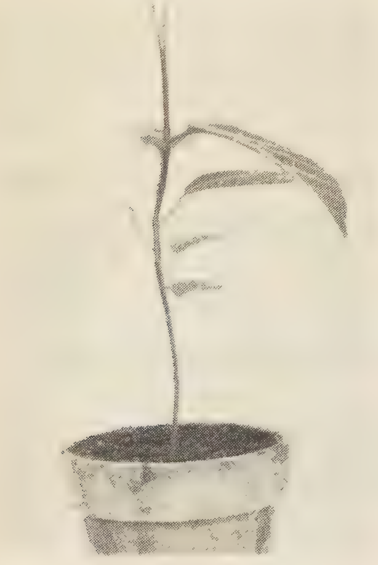


Fig. 2—Stock.

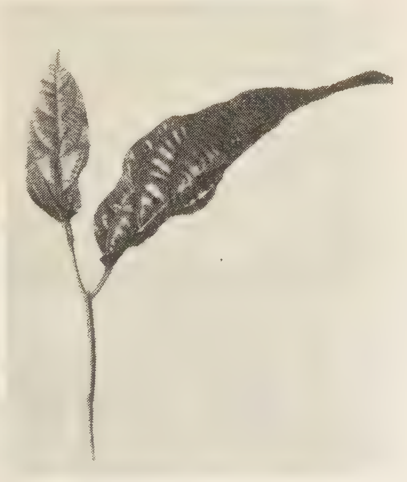


Fig. 3—Scion.

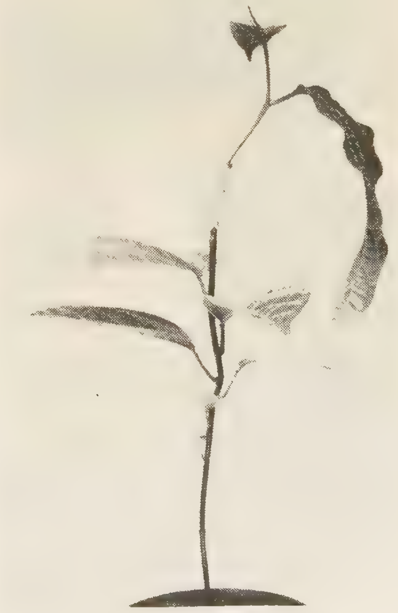
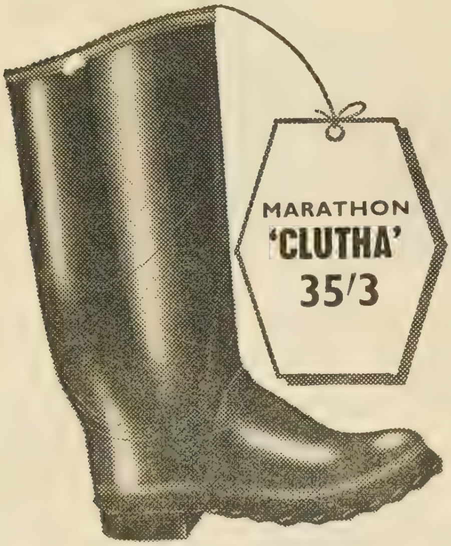


Fig. 4—Completed graft.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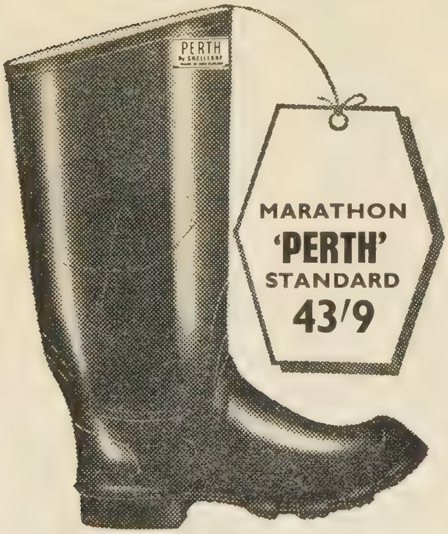
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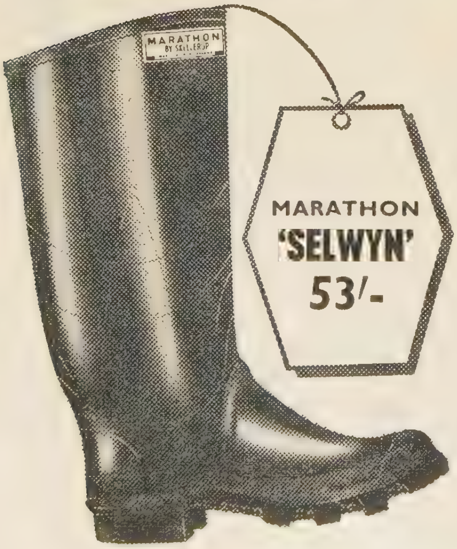
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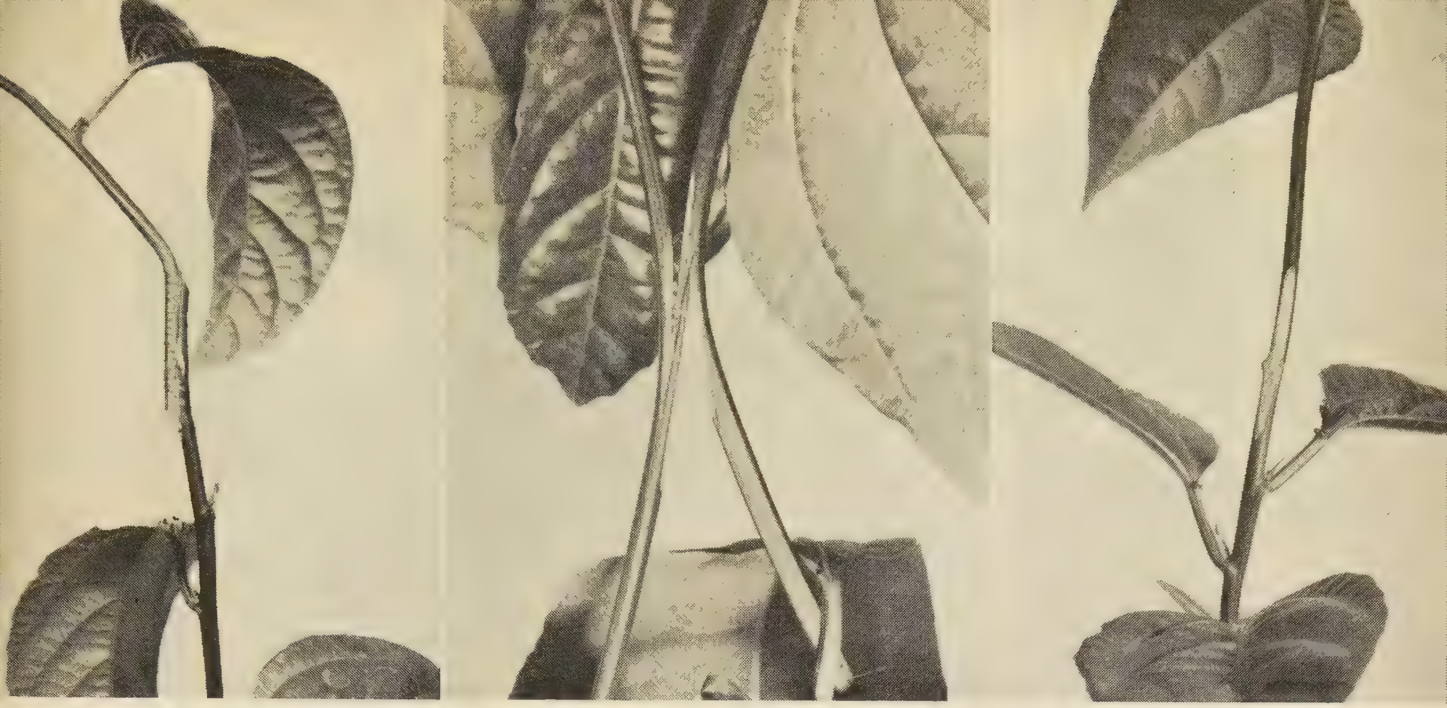

Approach grafting: Fig. 5 (left)—First operation. Fig. 6 (middle)—Tongueing. Fig. 7 (right)—Completed graft.

when ripe, and has a strong flavoured. less juicy, more acid pulp.

Other Species Used as Stocks

The banana passionfruit (*Tacsonia mollisima*) has at times been used as a rootstock for the purple passionfruit in New Zealand and Australia. Another vigorous species (*Passiflora coerulea*) has been used as a rootstock in South Australia and New South Wales. Such vines have been sold as "Nelly Kelly" passionfruit and have a strong tendency to send up suckers below the graft union.

Neither of these stocks appears to offer any advantages over the seedling purple passionfruit vine; claims of increased resistance of grafted plants to virus and fungous diseases have not been substantiated.

Raising Plants and Selection of Scion Wood

Plants of both purple and golden passionfruit have been raised at the Fruit Research Division from seed (chipped to hasten germination) sown in pots of sterilised soil in a glasshouse. Seed usually takes about 10 to 15 days to germinate. At about the three-leaf stage, seedlings are potted on singly into 4 in. pots. Growers may find it more convenient to raise seedlings sown outdoors in rows or broadcast in beds in early September and then, when they are large enough, to lift, graft and replant them.

Seedlings are ready for grafting when the stems are about ⅛ in. in diameter 9 in. from soil level.

For glasshouse propagation we prefer scions about 4 in. long taken from the tips of actively growing shoots. For outdoor propagation, scions of more mature wood about 2 in. long with one leaf should be chosen (Fig. 1). If the leaf is removed from the scion there is less wilting, but growth will be much slower.

Because plants of purple passionfruit are sometimes partially self sterile, a pollination problem could arise if all vines in a planting were propagated from a single plant. To avoid this, scion wood should be taken from several different, disease-free plants. In our trial work, scions were taken from young seedlings of purple passionfruit sown at the same time as the seed of the golden passionfruit.

A grafting height of 9 in. is recommended to avoid the risk of roots forming on the susceptible scion if a low-grafted vine is later earthed up, and also to give a fair length of resistant stem at that part of the plant where it is most susceptible to infection.

Grafting Methods

Cleft Grafting

This probably is the simplest of all grafting methods and is the one we used. First, the top of the stock is removed about 9 in. above the ground. Then with a thin-bladed, sharp knife, or razor blade a cleft is made down the centre of the stem to a depth of about 1½ in. (Fig. 2).

The base of the scion is sharpened to a wedge, the two slanting cuts being about 1½ in. long (Fig. 3). The scion is inserted in the cleft made in the stock and is pushed down into place so that the cambium layer of the scion comes in contact with that of the stock on at least one side. The scion should be inserted to the full length of the cut surface. The graft is then bound securely with raffia (Fig. 4).

At the Fruit Research Division grafted plants are then put in the mist propagator for about two weeks. At the end of that time they are taken out and the raffia ties removed if they are cutting into plants. If the graft is not well callused, a new tie is applied to prevent opening of the cleft. After a few days' hardening off, these plants are ready for planting out. Where no mist is available, newly grafted plants must be shaded from the sun and wind and lightly sprayed with water periodically every day.

Plants for the Te Puke trial were set out in pairs, each consisting of a grafted vine and the unworked purple passionfruit seedling which had been used as a source of scion wood for the grafted plant. If growers wish to compare the resistance to fusarium wilt of grafted and normal vines, they should also plant some unworked seedlings as "checks".

Approach Grafting

Another method of propagation growers may wish to try is the approach graft or inarch. For this, seedlings with a minimum height of about 20 in. are required to give the desired thickness at the 9 in. grafting height. Working with smaller seedlings than this is very difficult owing to the brittleness of the stem. Seed-

(Continued on page 405)

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OF the newer chemicals available MCA or monochloroacetate has been highly effective, particularly on crops of chou moellier in eliminating redroot (*Amaranthus retroflexus*) and willow weed (*Polygonum persicaria*) when these weeds were overtopping and smothering the crop. Rape, swedes, and turnips can also be treated, though turnips are much more susceptible to spray injury, and MCA should be applied on them with caution.

MCA is used after emergence. It is not effective against grasses or fathen. Fifteen to 20 lb of MCA powder dissolved in 25 to 30 gallons of pure water should be sprayed on per acre, with the boom lifted well above the canopy of weeds and crop. Bore or well water with a high iron or mineral content is not satisfactory. Swedes can be sprayed with MCA at 15 to 20 lb per acre when they have four or more true leaves, not before.

White-fleshed turnips of the York Globe and Hardy Green varieties are most susceptible to spray damage, but are tolerant at the six-leaf stage; by then, however, most weeds are too well developed to be effectively controlled by spraying.

MCPB and MCPA

MCPB is now the most widely used specific on canning or field peas and has replaced DNBP. MCPB is effective against Californian thistle (*Cirsium arvense*), seedling docks (*Rumex* sp.), fathen (*Chenopodium* sp.), and cornbind (*Polygonum convolvulus*).

Commercial preparations are available at two strengths—3 lb and 4 lb acid equivalent per gallon. The correct strength for peas is 1½ lb acid equivalent per acre, made by dissolving 4 pints and 3 pints respectively of the above strengths of parent weedicide in 20 or more gallons of water. Spray in fine, warm weather when the peas are 4 to 6 in. high.

In crops of wheat, oats, and barley MCPA will control most weeds without damage, but not grasses. Rates should be up to 1 lb acid equivalent per acre from the six-leaf stage through to the beginning of shooting. 2,4-D can also be used on barley which has a higher tolerance than the other cereals to hormones, and on this crop 2,4-DB and MCPB are safe at rates up to 1 lb and 1½ lb acid equivalent per acre respectively from the one-leaf stage onward.

Maize Crops

On maize the most effective herbicide has been the amine salt of 2,4-D, used from emergence to tasselling at rates up to 1 lb acid equivalent per acre. Water-soluble preparations of 2,4-DB at rates up to 1½ lb acid equivalent per acre have also proved satisfactory, particularly if willow weed is the dominant weed species. When maize is being sprayed the mixture should be directed as much as possible below the foliage. Spraying is prone to cause brittleness in maize stems, especially in the early stages of growth, and some damage to crops may occur in windy areas after the use of these hormones.

Vegetable Crops

In vegetable crops satisfactory weed control in carrots has been obtained from various grades of light aromatic oils specially prepared for weedkilling. A quantity of 44 gallons or more per acre is required, used from the one to four true leafed stage.

With onions weed control results have been variable and most growers prefer to control by cultivation. Sulphuric acid is used on seedling plants, but it often causes burning and does not control a wide range of weeds. CIPC used before emergence has given variable results and crop losses, particularly in light soils and where soil temperatures are high.

Various weedicides have also been tried on a wide range of other crop plants, information on which may be obtained from local officers of the Department of Agriculture.

—*D. M. E. MERRY,*
Farm Advisory Officer,
Department of Agriculture,
Pukekohe

Grafting Passionfruit

(Continued from page 403)

lings grown outdoors can be lifted, inarched, and then replanted in the nursery. Plants must be shaded and sprayed as in the previous method. A screen of hessian is quite suitable.

Inarching is done by cutting a corresponding sliver about 1½ in. long off both purple and golden seedlings about 9 in. from ground level (Fig. 5). The cuts are then tongued by making an upward cut 1 in. long in one plant and a downward cut in the other. Both seedlings are locked together and securely tied with raffia (Fig. 6).

In about three weeks the ties should be removed to prevent them cutting into the stem. Ties may sometimes have to be replaced for a further short period. The graft union will still be rather weak and care must be taken when cutting off the golden passion portion above the union and the purple passion section below the union (Fig. 7). This part of the operation could well be delayed for several weeks.

After Care

Apart from ensuring that the soil level does not build up too close to the graft union, the main point in after care is to remove promptly any shoots arising from the golden passion stock.

References

1. H. M. Groszmann and G. S. Purss, "Beating Passion Vine Wilt", Queensland Agricultural Journal, vol. 84, pp. 341-346 (1958).

2. J. M. Dingley, Plant Diseases Division, D.S.I.R., Auckland, unpublished data.

Photographs by Department of Scientific and Industrial Research.

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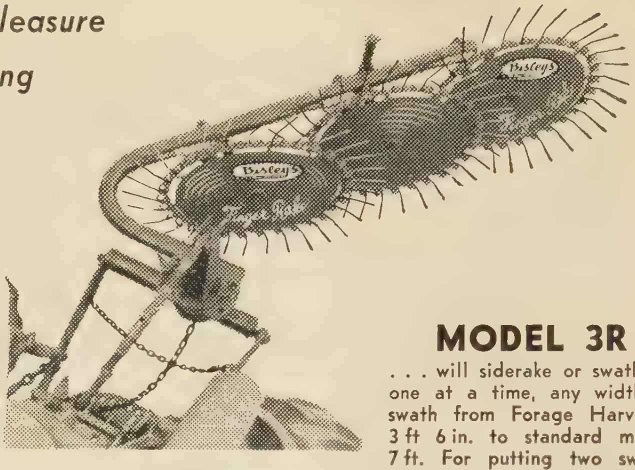

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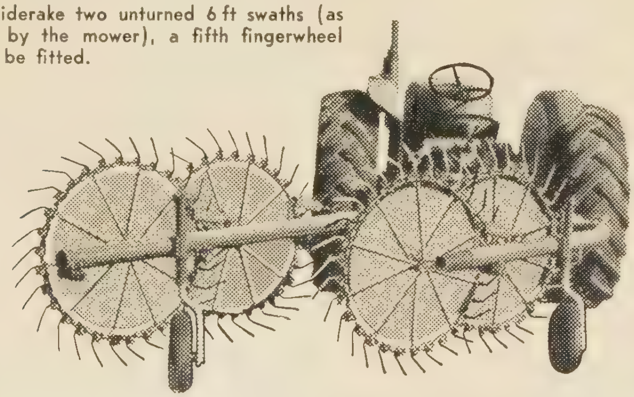
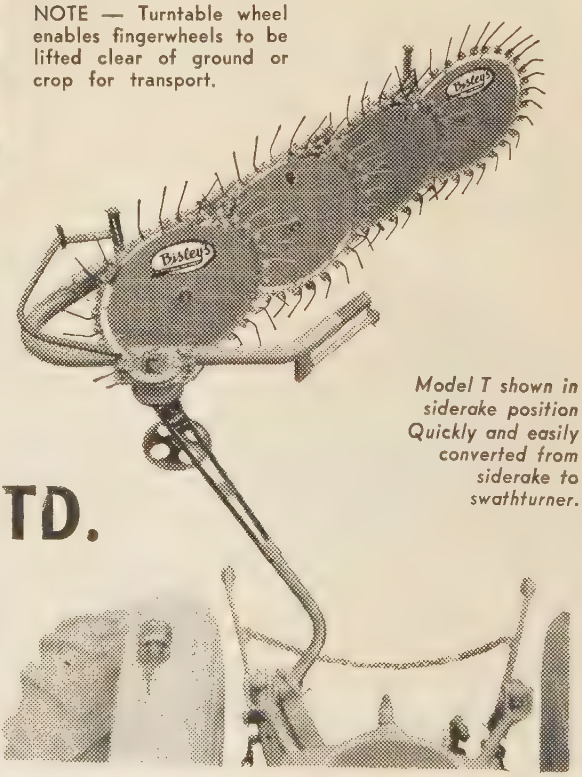


As illustrated in swathturning position.

MODEL T

This is the towed trailing version of Bisley's standard 3-point linkage machines. If desired additional fittings enable Model T to be converted to 3-point linkage for steep and difficult conditions. Similarly all mounted models (other than 3R) can be converted to towed design at little extra cost. Five to 10 minutes is the usual time for conversion from towed to mounted model or vice versa.

NOTE — Turntable wheel enables fingerwheels to be lifted clear of ground or crop for transport.



Model T shown in siderake position Quickly and easily converted from siderake to swathturner.

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Scotch Broom Controlled by Mowing after Poor Results from Spraying

By A. V. ALLO,
Farm Advisory Officer,
Department of Agriculture,
Tauranga

THOUGH Scotch broom (*Cytisus scoparius*) is very much less common than the ordinary broom (*C. monspessulanus*), it is a problem on some areas of newly developed volcanic ash country in the Bay of Plenty, particularly on soils derived from Kaharoa ash.

THE weed has been particularly serious on a property owned by Mr R. S. Atkinson of Pongakawa, near Te Puke. When, in 1957, Mr Atkinson worked up a block of virgin country out of fern and scrub, he had an excellent establishment of the sown pasture species, largely as the result of a heavy application of superphosphate, and it seemed at first that he was going to get an excellent pasture.

One-year-old Scotch broom averaging 4 ft high being mown with a tractor mower. This gave a 90 per cent kill . . .

. . . and an excellent pasture on the same area eight months later.

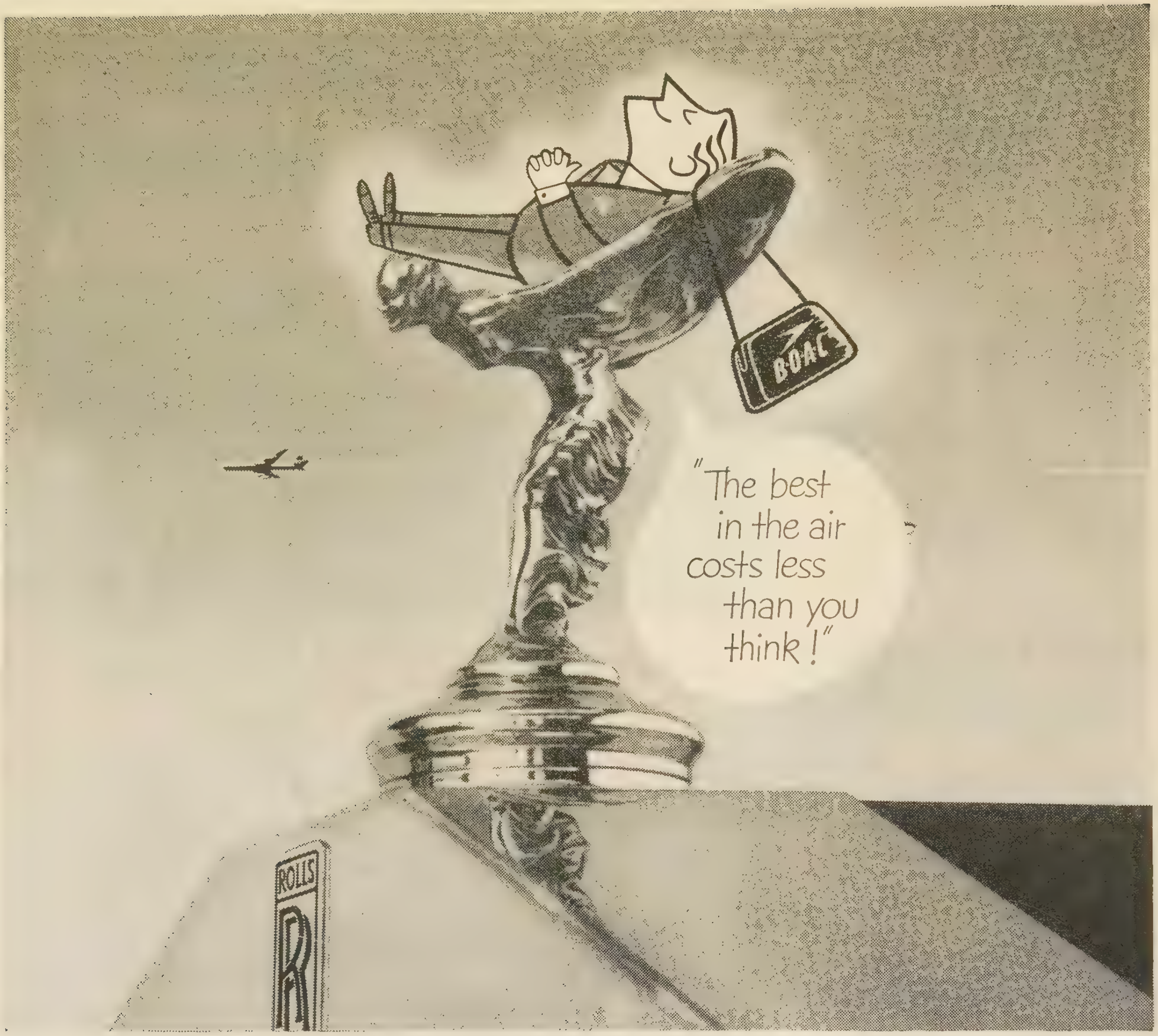
A few months after the area was sown down, however, seedlings of Scotch broom began to appear over the whole area, and it was evident that the pasture would be smothered out unless the weed could be checked. An effort was first made to bring the broom under control with sheep, which were turned on to the area when the weed was 3 or 4 in. high. This method of control failed. It was too hard on the pasture and did not kill the broom. Then, when the broom was from 6 to 12 in. high, Mr Atkinson boom sprayed in spring with the ethyl ester of 2,4-D at 1.3 lb acid equivalent per acre. Control was very poor. Though there was some distortion of plants and loss of leaf, most of the plants recovered.

The area on the left was sprayed with 2,4,5-T and that on the right was mown.

On 13 April 1959 Mr Atkinson sprayed trial strips of broom about 2 ft high with the butyl ester of 2,4,5-T at rates of 0.4, 1.3, and 2 lb acid equivalent per acre. All treatments resulted in considerable clover damage, even on the lightest rate of 2,4,5-T application, and control was only fair, being no more than 60 per cent even on the plot given 2 lb acid equivalent.

Use of Tractor Mower

In March 1959 an area of one-year-old Scotch broom, averaging 4 ft high, was mown with the tractor mower. Eight months later it appeared as if the weed had finally been brought under control, as over a 90 per cent



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kill had been obtained and there was an excellent pasture on the mown area. At the same time a patch of younger broom, about 12 in. high, was mown, and here results, though superior to those obtained from any of the spray treatments, were not so good. An area of tall Scotch broom mowed in May gave poorer results than those obtained from the March mowing.

Because of his experience so far Mr Atkinson is of the opinion that the most effective method of controlling Scotch broom is to mow in early autumn with either tractor mower or rotary cutter. Though the job is rather tough on an ordinary mower, with some breakages inevitable, the cost is still less than that for any type of spraying, particularly when one takes into account the very poor results from spraying.

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Book Review

"Soils and Agriculture of Part Geraldine County": J. D. Raeside, M. Cameron, and R. B. Miller

AN increasing number of soil bulletins are now becoming available as a result of the detailed soil surveys of areas of New Zealand conducted by pedologists of the Soil Bureau of the Department of Scientific and Industrial Research. The latest covers the downs and plains of Geraldine County in South Canterbury.

Information on the climate, vegetation, physiography, and geology of the area is followed by a section on the chemistry of the soils. Of special interest to farmers and others living in the district is the description of the different soil types and the problems associated with their use.

The section on the agriculture of the area has been contributed by M. Cameron, a Farm Advisory Officer of the Department of Agriculture at Timaru, and this could well serve as a pattern for future bulletins published by the Bureau. Unfortunately the time taken between the preparation of the material and its publication results in the statistical information relating to the farming being out of date.

The bulletin contains soil maps of the district on a scale of 1 in. to 40 chains.

—R.H.S.

Soil Bureau Bulletin No. 13; Government Printer, Wellington. 17s. 6d.

◆

Radio Broadcasts for Farmers

RADIO broadcasts to farmers during November are as follows:

1XH Hamilton, 12.33 p.m.

14 November—"Haymaking Methods", by J. R. Murray, Farm Advisory Officer, Department of Agriculture, Hamilton.

21 November—"Control of Flystrike and Ectoparasites in Sheep", by D. Bilkey, Livestock Instructor, Department of Agriculture, Hamilton.

28 November—"The Pumice Country; Its Problems and Its Future", by E. A. Neill, Federated Farmers.

1YZ Rotorua, 7.15 p.m.

2 November—Young Farmers' Club talk, by Piako Y.F.C. district committee.

16 November—"Recent Trends in Vegetable Growing in the Bay of Plenty", by B. M. Piper, Horticultural Instructor, Department of Agriculture, Tauranga.

30 November—"Grading of Milk and Cream", by R. J. Preston, Dairy Instructor, Department of Agriculture, Hamilton.

2XG Gisborne, 8 p.m.

1 November—Talk by R. W. Scaife, Sheep and Wool Instructor, Department of Agriculture, Gisborne.

8 November—"For the Orchardist", by J. Overbye, Instructor in Horticulture, Department of Agriculture, Gisborne.

22 November—"Practical Hints for Poultry Keepers", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Gisborne.

29 November—"Topdressing and Oversowing", by T. A. Sellwood, Farm Advisory Officer, Department of Agriculture, Gisborne.

2XA Wanganui, 8 p.m.

3 November—"For the Country Woman", by Mary Macdonald.

10 November—"Farming News".

17 November—"Management is of Major Importance", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

24 November—"Pest and Disease Control", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

1 November—"Soil Conservation", by S. T. Anaru, Farm Advisory Officer (Soil Conservation), Department of Agriculture, Hastings.

15 November—"Livestock Troubles", by J. G. Niccol, Livestock Instructor, Department of Agriculture, Hastings.

29 November—"Lucerne", by A. J. Coughlan, Fields Instructor, Department of Agriculture, Hastings.

3YA Christchurch, 12.20 p.m.

7 November—"The Department's Farm Budgeting and Recording Service", by R. C. Stuart, Farm Advisory Officer (Economics), Department of Agriculture, Christchurch.

21 November—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

7 November—"Wool in the Shearing Shed", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill.

14 November—"The Farm Budget", by R. H. Smith, Farm Advisory Officer, Department of Agriculture, Invercargill.

21 November—"Pasture Topdressing in South Otago", by R. C. Stephen, Farm Advisory Officer, Department of Agriculture, Balclutha.

28 November—"Poultry Farming Overseas", by J. Jones, Poultry Instructor, Department of Agriculture, Oamaru.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal", including "Report from Ruakura"), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. ("Country Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

1XN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report", followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

1XH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Bay of Plenty Journal"), Thursdays, 12.33 p.m. ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer") and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Thursdays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XB Masterton, Fridays at 6.45 p.m. ("Farm Session").

2XN Nelson, Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest"), and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer"), and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service"), and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m., Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Wednesdays and Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

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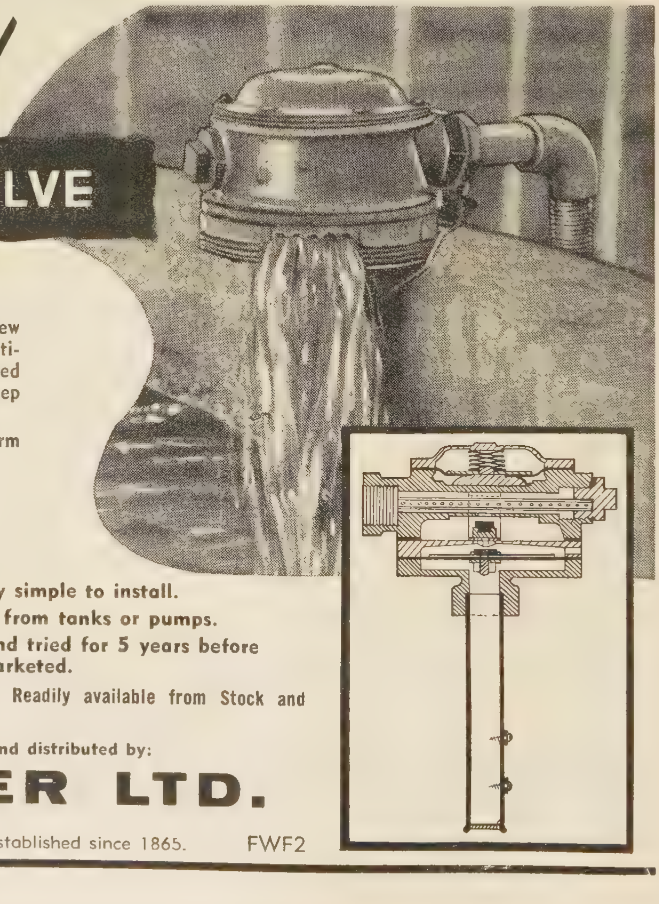

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The Place of the Chisel Plough in New Zealand

By M. W. CROSS,
Senior Lecturer in Farm Machinery,
Massey Agricultural College

THE name "chisel plough" is an unfortunate misnomer, because the implement belongs entirely to the cultivator-scarifier group. The use of the term "plough" currently infers the inversion of the soil, and this is what the chisel plough is designed NOT to do. The term chisel refers to the original type of point used on the implement when it was then a light subsoiler, but unfortunately the name now covers almost any implement from a ripper to a spring tine cultivator. But as it can perform all these operations, perhaps one should not quibble over nomenclature.

CHISELS and subsoilers are used primarily to break through and shatter compacted or otherwise impermeable soil layers and other barriers to the movement of water and plant roots. The most effective results are obtained when the soil is dry, thus contributing to the shattering action. With some soils the beneficial effect tends to be lost rather rapidly as subsequent rains or irrigation cause the soil to run together again.

Subsoilers have one or more heavy standards that can be operated at depths of 24 to 30 in. or more depending on the power available.

Chisels or chisel ploughs have a series of heavy, robustly mounted tines widely spaced on a rigid frame to allow trash clearance but arranged to rip the ground at about 12 in. intervals. Though the tines are not free to follow ground contours independently, most chisel ploughs incorporate an overload release on each tine to provide a stump-jump action, some have provision for limited lateral movement under pressure, and others have the tines made of heavy duty spring steel.

Thus the major difference from a subsoiler lies in the tine action. Whereas the rigid subsoiler tine will shatter or break through everything it encounters, the chisel tine will yield if resistance is too great. In the field, owing to the wide and sudden changes in soil resistance encountered, especially in dry soils, there is a vibratory action, which itself improves pulverisation of the loosened material. Under these conditions the bottom of the cultivated soil is not uniform, as with a plough, but ridged and pitted.

Tines may be spaced up to 4 ft laterally and up to 30 in. diagonally. This affords ample trash clearance, though it is possible to clog the implement if the trash is very thick.

The chisel plough rips the ground about every 12 in. Trailed models have three or four rows of tines widely spaced in each row but arranged to give the same final result as shown by this mounted model.

The tines may be equipped with a wide variety of replaceable teeth, shovels, or sweeps somewhat similar to the arrangement of a field cultivator and it is these attachments that really determine the effect of the implement on the soil. Provision is frequently made to permit variation in lateral spacing so that row-crop work is possible. The points can be operated at depths well below the normal ploughing zone if the impervious zone is relatively thin and if adequate power is available.

This article is adapted from a paper given at the Massey Agricultural College Sheepfarmers' Conference.

Under adverse soil conditions, or when it is undesirable to invert the soil, chisels are sometimes used for deep tillage in place of ploughs. Since chisels do not pulverise the soil as well as ploughs, a greater number of trips over the field are necessary to obtain a good seedbed after chiselling. This is almost invariably accompanied by a spacing of cultivations so that weathering may assist the breakdown of both soil and organic matter.

Versatility

Because of its simple basic design and robust construction the chisel plough lends itself to adaptation probably more than any other single implement and this has been one of the reasons for its popularity overseas. Another is undoubtedly the fact that soil and climate have been favourable for its use. Results are all too frequently credited to the chisel plough without mention of the attachments used, the way it was employed, or the management or stocking practices followed. Thus it tends somewhat to flourish under false colours.

The following example serves to illustrate the point. Three farmers from widely separated districts extolled the virtues of the chisel plough. Closer investigation revealed that:

Farmer A had used his chisel plough, fitted with a single tine to which a specially made mouldboard had been attached, for ploughing contour furrows on sloping land in a low rainfall area. The results had been well worth while.

Farmer B had used his plough for top working arable land after ploughing. This was the only other tillage implement used for preparing the seedbed and proved cheap, quick, and perfectly satisfactory.

Farmer C had used his plough to bring in an area of neglected river flat which was too rough for ploughing with a medium sized mouldboard plough because of silted-up tall fescue stools. Concentrated stocking reduced the top growth and this was followed by spaced cultivations with the chisel plough. After cultivation over about four months the area was sown to pasture.

These examples illustrate the versatility of the implement, but in no case was it used for the purpose for which it was designed originally.

The chisel plough was evolved to meet cultivation requirements in areas of low rainfall where inversion of the soil and burial of surface trash was undesirable because of loss of moisture, the risk of wind erosion, or the dispersion of the thin fertile surface layer. It has since been used on areas subject to erosion after occasional heavy downpours, where ploughing, by loosening the soil to a uniform depth, has induced channelling or sometimes severe sheet erosion. Chisel cultivation, especially if done across the slope, produces an irregular bottom to the cultivated soil and hence minimises runoff and channelling. The chisel plough is therefore a safer implement

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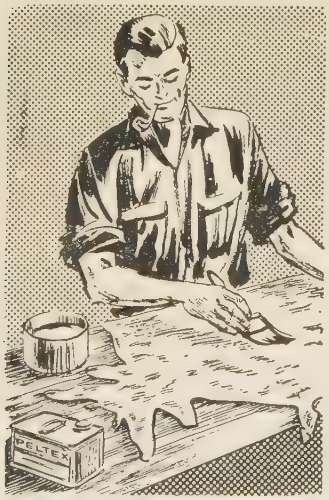

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to use; the likelihood of permanent damage from erosion after its use is not as great as with the plough. Conversely, certain soils with a high clay content when thoroughly wetted may be prone to large-scale slippage.

In arid or semi-arid regions, especially if a surface mulch in the form of residue from a previous crop is present, subsurface tillage has generally been found satisfactory. The chisel plough, with its staggered arrangement of tines and wide variety of attachments for the points, can perform this operation. Adequate penetration, self-cleaning, and a reasonable degree of soil pulverisation are the requirements it fulfils. When the tillage is done on land too dry for satisfactory mouldboard ploughing, maximum shattering and pulverisation will be achieved as well as a better kill of weeds. The depth of tillage depends on the type of crop to follow, but is seldom more than 6 in. and usually between 3 in. and 5 in.

Pasture Ripping

Another widely publicised use for the chisel plough has been pasture ripping. P. A. Yeoman's book, "The Keyline Plan", describes the methods employed to increase and maintain production throughout the year in an area subjected to wide variations in rainfall—torrential downpours followed by long dry periods.

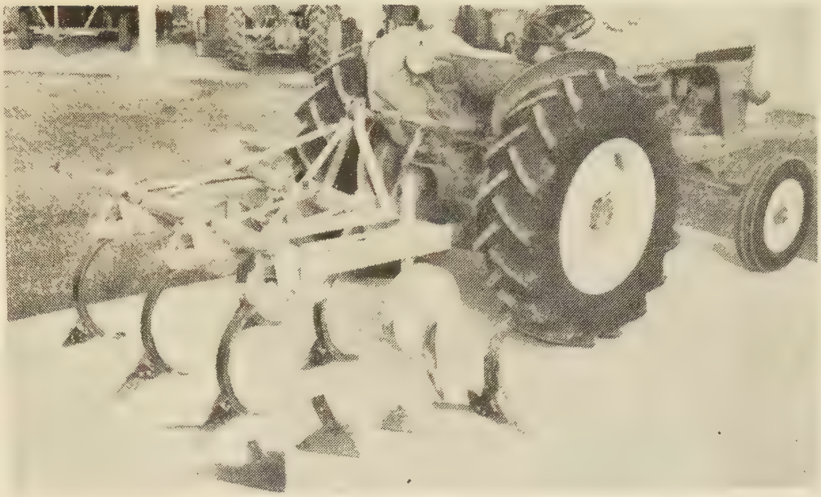
He rips the pastures to a depth of about 6 in. slightly off contour. During heavy rains the water has a chance to soak in and as the ripped channels reach saturation point it is led gradually toward the spurs of hills instead of concentrating in the gullies.

The ripping slows up the movement of water, ensures thorough wetting of the topsoil to the depth of the ripping, and allows more time for penetration into the subsoil. By this means the rainfall is more evenly distributed through the ground and less flooding of the lower land occurs. It is impossible to store falls of 6 to 7 in., but even then runoff is considerably reduced and the ripped ground is thoroughly wetted to the depth of ripping before runoff occurs. For this work the chisel plough is equipped with the points most suited to the type of soil, but generally the narrow chisels are satisfactory.

Power

No general ruling can be given on the power required to pull a chisel plough, because there are so many variable factors. However, a reasonable estimate for most work would be to allow five drawbar horsepower per tine per 4 in. depth for the first time over.

The chisel plough is obviously very versatile and can produce good results where suitably employed, but no one should think it has a magical touch. Because it has produced outstanding results does not mean that it will do this wherever it is used. It is dangerous to jump to conclusions and equally dangerous to attribute miraculous results to any one implement, chemical, mode of cultivation, or system of management. Rather are results achieved by the correct combination of all factors. If any one practice appears to create a better environment for plant growth, it is wise to examine its potential for the specific area or property.



One manufacturer's version of a "mounted" chisel plough with a selection of the attachments available for the tines. Because of restrictions on size, overhang, and weight, mounted chisel ploughs do not have the trash-clearing properties of trailed models, whose tines may be up to 4 ft apart laterally and 30 in. diagonally.

Probable Uses

Some of the more obvious probable uses for the chisel plough in this country are:

1. As a cultivating implement in the dry or humid areas, either in conjunction with the plough or as the only primary tillage tool: If only the chisel plough is used, cultivation will have to be spread over a fairly long period to take advantage of weathering to kill turf and assist the breakdown. The implement would then replace the field cultivator or grubber.

2. For cultivation on gravelly soils: There is every indication that it would be suitable, because it is easier to push stones aside than to try to cut them and, as there is little or no inversion, less moisture is lost.

3. For breaking in new country, especially hill country: Because of its trash-clearing qualities, extreme ruggedness, and ability to be altered in size to suit the power available, and in its effect on the soil to suit the land, it could probably well replace giant discs for much of this work in the drier areas. It would give less ridging and a better levelling effect than giant discs and there would be less tendency to move soil downhill. Additionally, it should work with equal efficiency across its full width, which discs do not do when working across a slope. Cultivation would be spread over a period as with discs. If the work is done across the slope, the ripping effect of the tines may minimise erosion.

4. For shattering or subsoiling where an impervious layer or pan that is reasonably shallow (say 9 in.) overlies free-draining soil or existing drains: Obviously power requirements will be increased, as it is preferable to subsoil when the ground is dry, and accordingly the working width will have to be decreased. As each tine is provided with a stump-jump release, the depth of work will be limited by the breakaway tension of the release.

5. For pasture ripping as described in "The Keyline Plan": In areas of low to medium rainfall, particularly if it is not well distributed throughout the year, this practice may be beneficial and the chisel plough is well suited to this work.

6. For overdrilling: With seed and fertiliser boxes attached it has been used successfully for overdrilling in 12 in. rows, which is sufficiently close for low rainfall areas. As the tines are positively attached to the frame, there is no provision for independent vertical movement. Hence bridging will occur on uneven ground.

It must be emphasised that the chisel plough was designed primarily for dry land farming. Deep cultivation of clay soils to say 9 or 10 in. will, by loosening the soil to a greater depth than normal, increase its water holding capacity in a wet season and may have a very adverse effect on the subsequent crop by producing waterlogged conditions. This effect has been produced in trial sowings using a variety of crops.

On the other hand, subsoiling to 12 in. in a Massey Agricultural College methods-of-cultivation trial produced drier conditions, less nitrification, and lower subsequent yields compared with orthodox cultivation. Hence it is probably safer to restrict the use of the chisel plough in wet areas to naturally free draining soils or to confine its employment to drier regions; there depth of working should generally not exceed 5 to 6 in.

◆

Mr A. G. Brash to Be Livestock Superintendent at Auckland

MR A. G. BRASH, Veterinarian in the Department of Agriculture at Christchurch, has been appointed Livestock Superintendent in the Department at Auckland. He succeeds Mr D. W. Caldwell, who was recently appointed Chief Advisory Officer (Animal Health) in the Department.

As Livestock Superintendent at Auckland Mr Brash will be in charge of the Department's animal husbandry, animal disease control, and meat inspection services in the northern half of the North Island.

Mr Brash.

Mr Brash is 43 years old. He joined the Department as a Veterinarian in Christchurch in 1940, having graduated B.V.Sc. at Sydney the previous year. He has remained in Christchurch for the past 20 years and is a particularly well known officer of the Department there.

In 1952 Mr Brash diagnosed the first recorded outbreak of scrapie disease in sheep in New Zealand and as a result of this early diagnosis and the strict slaughter and quarantine policy adopted, this serious disease was eventually eradicated.

◆

New Appointment for Mr T. P. J. Twomey

MR T. P. J. TWOMEY, Superintendent of Market Milk in the Dairy Division of the Department of Agriculture, has been appointed Technical Adviser to the New Zealand Dairy Products Marketing Commission.

Mr Twomey was born in 1912 and educated in Ireland. He obtained the Diploma in Dairy Science at Cork University in 1932, and subsequently worked in dairy factories and milk treatment stations in Ireland and England until he joined the Department in December 1946.

As Superintendent of Market Milk Mr Twomey supervised the operation of milk treatment stations throughout New Zealand and played a major part in the milk industry development and reconstruction programme which followed the findings of the Milk Commission in 1943. He assisted the Milk Marketing Division, the Central Milk Council, and the New Zealand Milk Board on technical matters associated with market milk and helped in the introduction of the town milk grading scheme, aluminium-capped milk bottles, standardised milk, baby milk, and homogenised milk.

In 1955 he visited the U.S.A. and Europe as part of a study tour of the milk industry overseas. Later he made several visits to South and South-East Asia in connection with dairy development projects sponsored by New Zealand under the Colombo Plan. In 1957 he was seconded for two years to the Government of India as a resident dairy consultant with particular responsibility for the planning of the Delhi and other milk schemes.

In his new position Mr Twomey will assist the Commission in its work of selling New Zealand's dairy products overseas by providing a technical advisory service to existing and potential buyers of New Zealand dairy products.

Mr Twomey.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July 1960 and for the 12 months ended 31 July 1960 with comparative figures for the same month and the 12 months of 1958-59 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
July 1960	2,728	9	2,737	—
July 1959	2,807	4	2,811	—
Increase or decrease	—79	+5	—74	—2.632
12 months ended 31/7/60	161,418	2,986	164,404	—
12 months ended 31/7/59	178,399	2,718	181,117	—
Increase or decrease	—16,981	+268	—16,713	—9.227

Butter in store at 31 July 1960 was 7,695 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
July 1960	135	—	135	—
July 1959	51	—	51	—
Increase or decrease	+84	—	+84	+16.471
12 months ended 31/7/60	75,901	11,316	87,217	—
12 months ended 31/7/59	66,474	13,429	79,903	—
Increase or decrease	+9,427	—2,113	+7,314	+9.153

Cheese in store at 31 July 1960 was 7,450 tons

If these figures are converted into butterfat equivalent, there is a decrease of 6.244 per cent in butterfat graded for the 12 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export and do not include butter and cheese used on the local market and other products such as anhydrous milk fat, whole milk powder, and other whole milk products, and are not necessarily a true indication of production trends.

Foliage for Effect in the Flower Garden

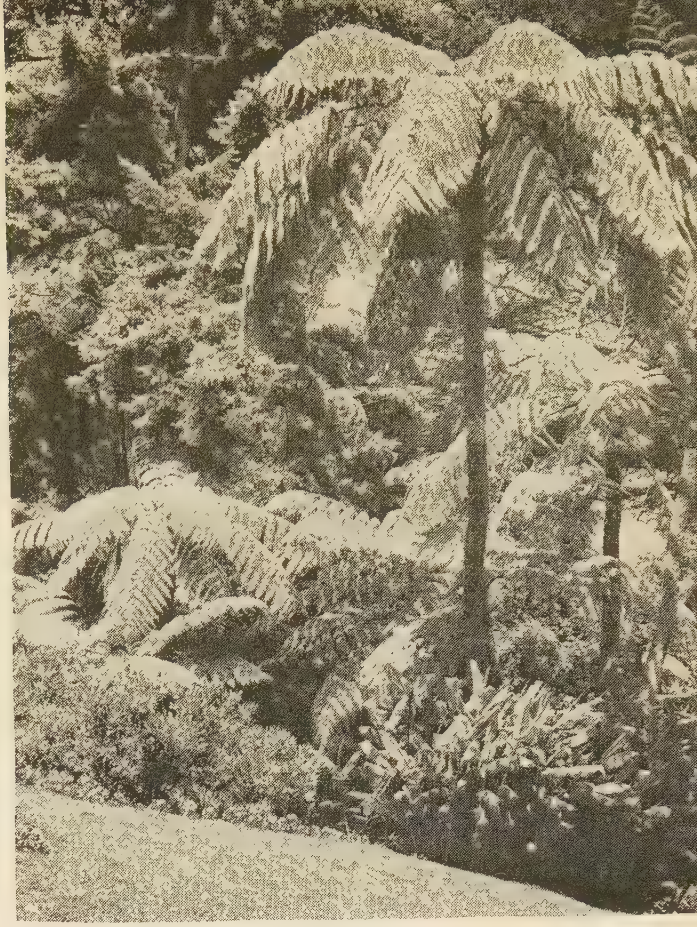
By J. P. SALINGER,
Horticultural Advisory Officer (Ornamentals),
Department of Agriculture, Wellington

GARDENERS usually depend on flowers or berries to provide colour in the garden, but foliage either individually or in the mass can be equally effective and even more permanent and is especially important in winter in those areas where cold weather precludes the use of striking flowering plants. Many plants, of course, are colourful, both in flower and foliage, and these can be doubly useful, but even the foliage plants themselves can produce a most attractive effect; in fact this feature should be used more frequently in the garden.

WHEN buying plants, gardeners usually judge them for their beauty of flower, but they should also consider their overall effect—the general shape of the plants, the density of growth, and the reflective or absorptive power of the leaves. Though both camellias and roses are beautiful in flower, their general effect is quite different, a camellia normally having a dense, solid growth with dark but reflective leaves, while roses are judged almost entirely on their beauty of flower and occasionally on their fruits, the hips. One seldom admires a rose for its beauty of form as an individual plant.

Growth can be either dense and compact or loose and spreading, rhododendrons on the one hand giving an impression of density while azaleas provide a much lighter effect. Leaf texture also is an important feature; it can be dark with a matt surface in contrast to polished green leaves or coloured leaves with a reflective surface.

Apart from plants with green foliage, and the green can be anything from a very dark almost black green to a brilliant yellow green, plants can be obtained with leaves of many other colours—bronze, purple, yellow, gold, silver grey, and almost white. In addition many plants have variegated leaves, which are basically green but have coloured margins or marks on them. Some plants also may have brilliant colours in their young growths, and, of course, there is always the beauty of the autumn colours of deciduous trees or shrubs. In fact many horticultural varieties of ordinary plants have been selected because of this variation in leaf colour, for instance, the variegated ivy, golden elm, and bronze flax.



Tree ferns are especially beautiful, because their light green leaves reflect the light. They contrast well against a dark background such as pine trees.

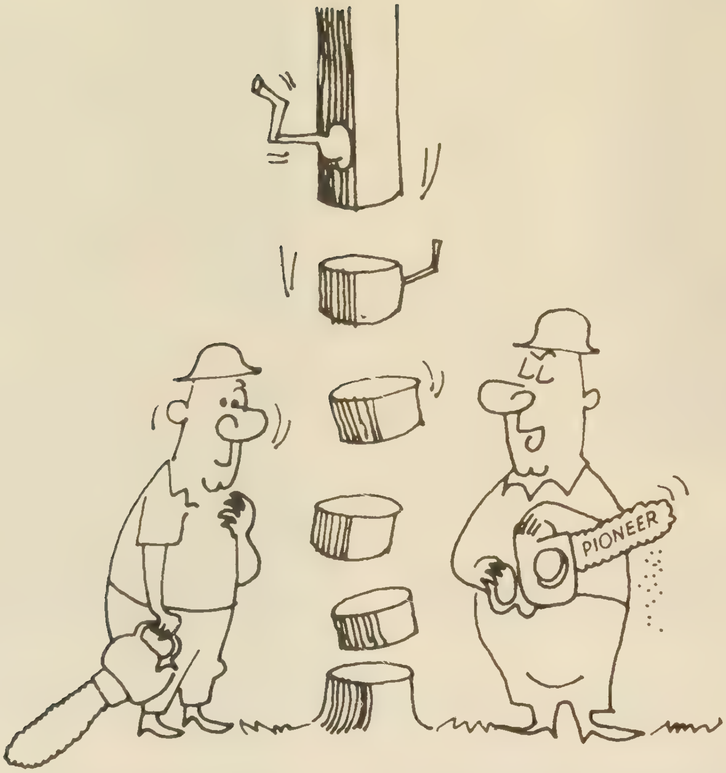
Use of Coloured-leaved Plants

A most effective garden can be made with coloured-leaved plants only, but generally they should be used with discretion either to provide a foil for other plants or to accent an area, especially in winter. Plants of a subdued dark green or brownish colour provide a background to more vivid colours, while those with gold, silver, or purple leaves can be used for accent. Grey foliage dwarf plants provide an attractive border both to bright- and pastel-coloured flowers.

Occasionally a coloured hedge will provide an interesting contrast to most green-leaved hedges. There are several plants for this purpose: Abelia *Photinia glabra rubens*, golden lonicera and privet, purple ake ake, and variegated box.

Plants with grey leaves are generally resistant to wind and salt spray damage, as the colour of their leaves is formed from minute hairs or scales. These plants are particularly suitable for coastal areas and provide a contrast to the other type of wind-resistant plants—those with hard, glossy green leaves.

Coloured-leaved plants are particularly attractive when blended on the margins of pools and streams. The water will reflect both their colour and shape. Along larger areas of water, willows of various species are



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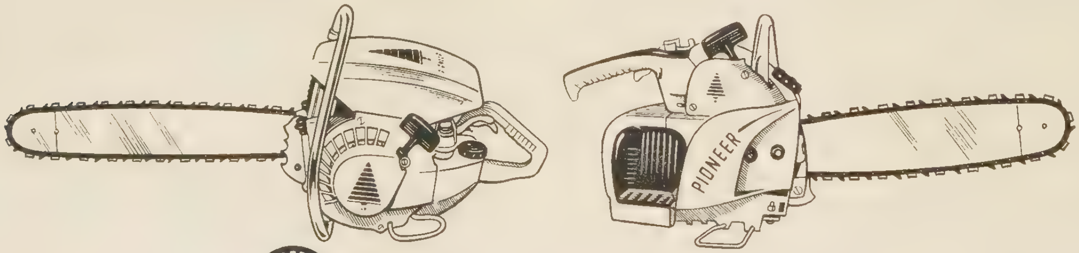

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A border of coloured-leaved shrubs including rosemary, variegated hebe, purple flax, and variegated matipo.

Golden euonymus contrasts with the deep colour of purple-leaved prunus.

particularly suitable, and near small pools dwarf bamboo, ferns, and hostas are suitable.

In the rock garden the dwarf conifers are very useful for their foliage and shape, but many of the dwarf alpine plants can be used for the same purpose; saxifrages and primulas, the native celmisias, and pachystegia are all attractive.

On steeper rocky banks more vigorous plants like arctotis, bugie, and the variegated forms of tradescantia and ivy will provide a colourful ground cover.

Among coloured-foliaged trees and shrubs the many variegated forms of popular conifers are especially useful. Some of the tree species of these are attractive themselves because of their shape and growth habit, such as the deodar cedar and Spanish fir.

The few deciduous conifers are attractive in spring as the young growths develop and again in autumn before the leaves fall. These conifers are larch, swamp cypress, and dawn redwood.

There are many attractive variegated forms of the evergreen conifers, especially of Lawson's cypress, Japanese cedar, junipers, and yew. They grow in upright or spreading forms, but some are quite dwarf and suitable for the rock garden. These plants are generally less resistant to the wind than the normal form and so should be given some protection to develop their true habit and full colour.

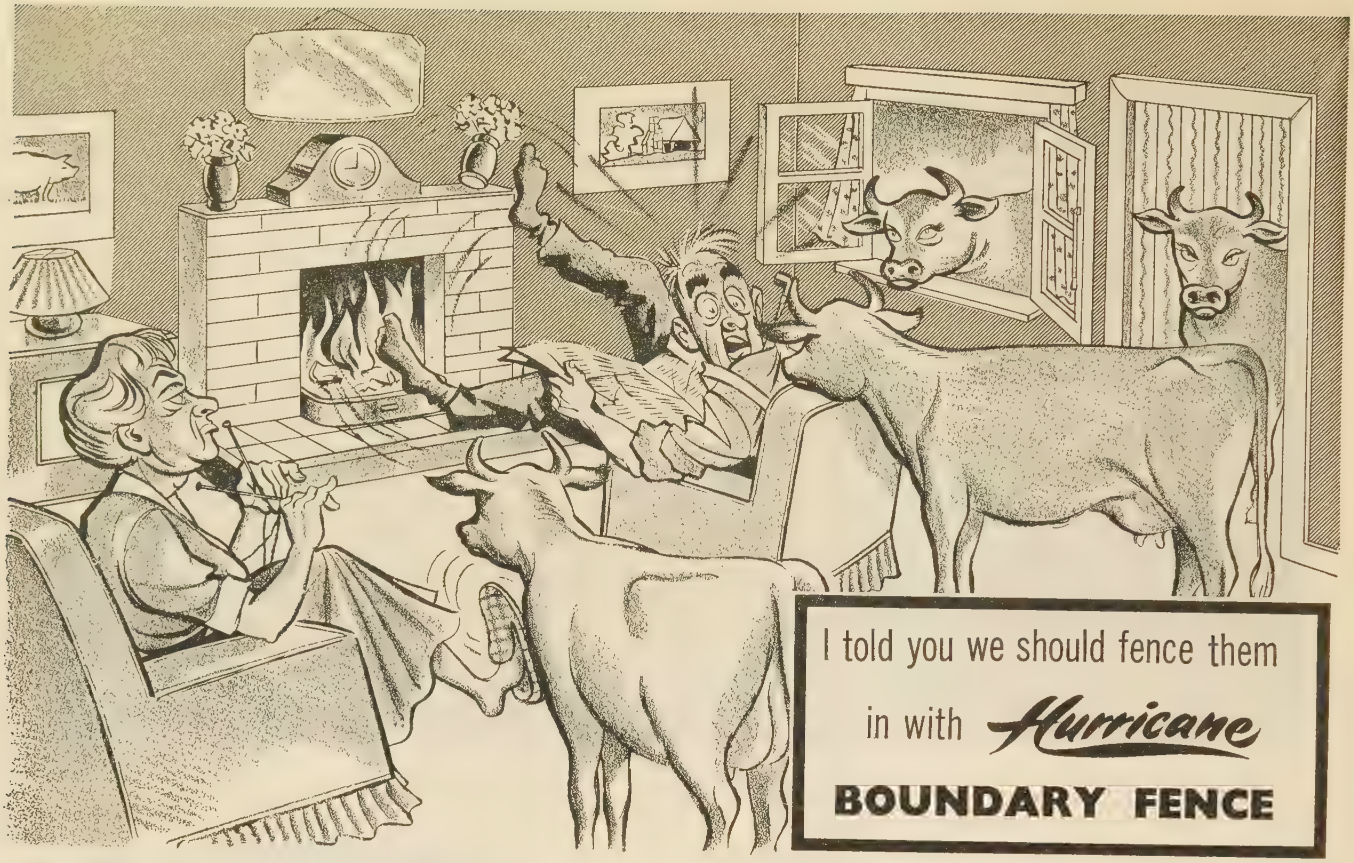
Evergreen Trees and Shrubs

A few evergreen trees in their natural growth provide a distinct colour; *Magnolia grandiflora*, for instance, has a brownish underside to the leaves, and holly and camellia varieties frequently have variegated leaves. There is no doubt, however, that New Zealand native trees and shrubs, though not outstanding for flowers, are most effective in foliage; overseas, plants such as black matipo are cultivated commercially for this purpose.

Golden privet makes → an attractive shrub when allowed to grow freely. It can also be trimmed for a hedge.

The wide range of colour that can be obtained in native plants is shown by the large green leaves of puka, the yellow green of young rimu, the variety of greens in *Pittosporums*, the grey of senecios and some olearias, and purple ake ake; in addition there are garden varieties of many natives such as variegated lacebarks and the variegated parapara. New Zealand natives provide an alternative to many conifers and could certainly be used much more than they are, purely for foliage effect.

Some South African plants on the other hand, are beautiful for their silver or grey foliage; they include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Deciduous Trees and Shrubs

Deciduous trees and shrubs can provide much beauty, especially in spring and autumn. A few species have coloured leaves and are attractive all through summer; they include maples, purple-leaved plum, claret ash, and golden elm, while there are variegated forms of abutilon, diervilla, bamboos, and dwarf heaths.

Herbaceous and Bedding Plants

In addition to trees and shrubs many bedding plants are effective for their foliage colour; they include alternanthera, irisine, fibrous begonia, and burning bush. Variegated forms of geranium are frequently used for bedding and these coloured-leaved plants generally can be used for group effect by themselves or to blend with more brightly coloured flowers. In formal bedding schemes large plants such as the purple castor oil plant or variegated abutilon are used as individual specimens, while at other times dwarf plants like variegated arabis or golden feather are used as edging plants.

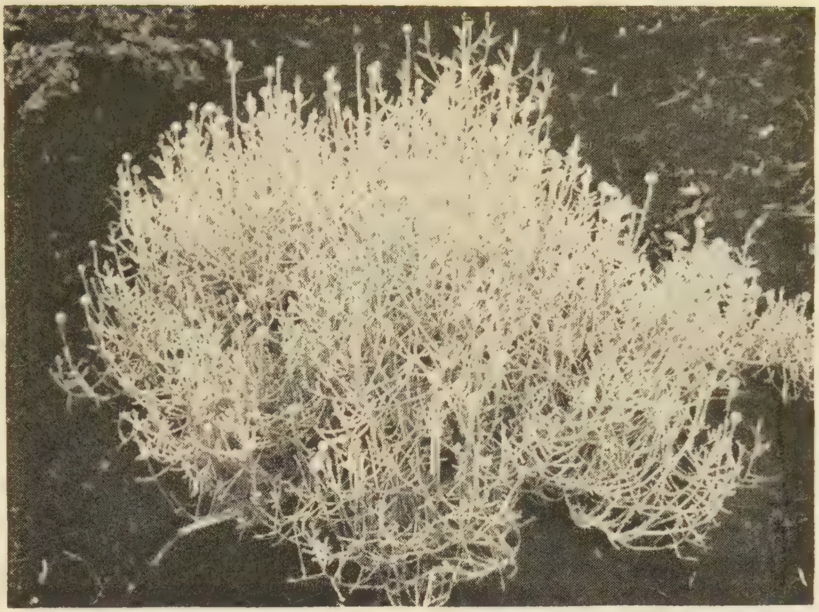
Herbaceous plants are usually grown for their beauty of flowers, but a few also have attractive foliage. In particular there are variegated hostas and the purple-leaved *Lobelia cardinalis*; the various dusty millers provide a grey or silver foliage which can be most effective. Their very name indicates their foliage.

Even the vegetable garden can provide coloured varieties of popular vegetables and herbs and these are frequently grown for both ornamental and culinary use. There are coloured-leaved kales, willow-leaved beet, and coloured-stemmed silver beet, and among herbs there are many coloured-leaved forms of thyme and sage.

Work for November

New Zealand gardens are probably at their loveliest in November. It is the month of roses, not only the modern varieties but also the old fashioned shrub roses. Their beauty may be fleeting, but a garden of these old types is a sight, and scent, to remember.

By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland



[Elliott

Calocephalus browni, with silvery white foliage, is frequently used as an edging or dot plant in borders.

Few people can resist the charm of Cecile Brunner, which is rarely without a flower and flourishes in most gardens; and there are other equally attractive varieties, most of which are now stocked by specialist nurserymen. Most old fashioned shrub roses should be pruned immediately after flowering, as much as possible of the old wood being removed to allow the young stems to grow and ripen well.

Those who intend planting up more roses in their gardens would be well advised to visit shows this month. The individual flowers are more easily compared on the show bench and there is usually a good display of the standard and newer varieties. This first selection should be followed up with a visit to the nursery in February, when the plants will be in full flower, so that the vigour and habit of the varieties and therefore their garden merit can be judged.

Flower Shows

Most flower shows are held throughout the country this month and a gardener usually learns a little from each. Those who plan to exhibit for the first time can learn much from studying the prizewinning exhibits in any of the larger shows. They will realise the standard that is expected and the faults to avoid in the selection or staging of the blooms.

So much depends on the selection of blooms; an even collection of high quality must be picked at the right stage and then given the right treatment so that the blooms are at the peak of their perfection when the judge sees them. Most blooms should be picked 24 hours or more before and stood in deep, cold water in a cool, dark place until they are taken to the show. Picking before they are mature will cause some flowers to droop. If blooms are left too long on the plant, the pollen is shed and they begin to age. Making some experimental pickings before the show is worth while to discover the best stage at which to pick them.

Judging Points

In the selection of flowers the following points should be remembered, as they are the ones on which the flowers will be judged: Stems should be straight, firm, and strong enough to carry the bloom at the correct angle. Foliage should be healthy and unblemished, any spray deposit having been sponged off. The flower should be well shaped, with firm, unblemished petals of good quality and texture and even or well marked colouring. Florets in the centre of a daisy-type flower should be young and preferably without pollen showing. Spikes should be straight and evenly tapering, with as many flowers open as possible without the oldest flowers fading or having been removed. The flowers on a spike should be evenly spaced without gaps or overcrowding.

Naturally there are finer details to be considered for each flower, but these can be learnt only by studying the best specimens of that flower and by getting advice from specialist growers.

Carnations

Carnations and gerberas are a feature of most New Zealand gardens and some home gardeners are hybridising and raising new varieties. Many more save seed and take a chance on

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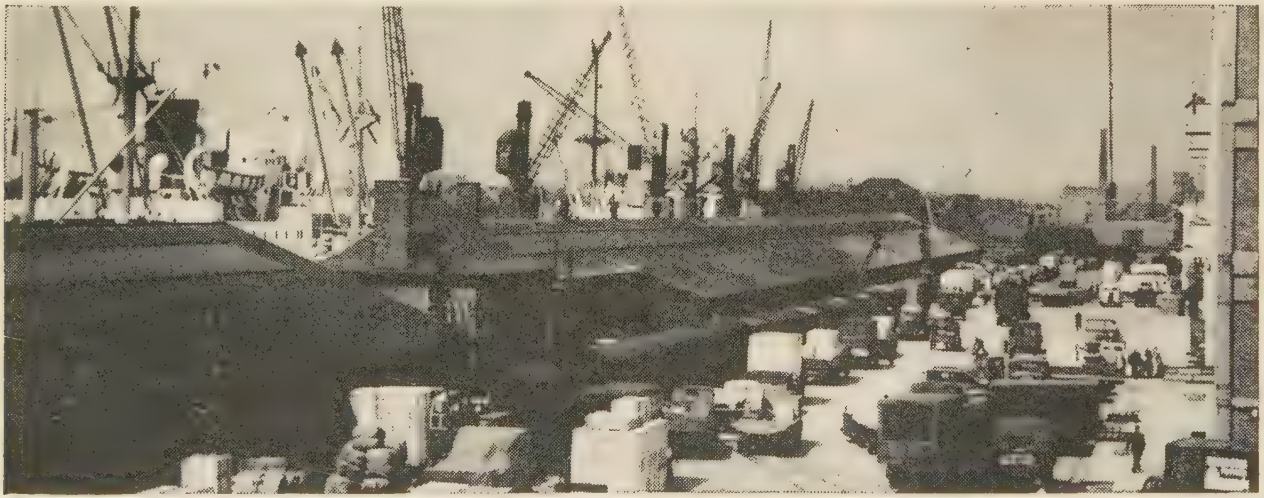

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the parentage, so that the resulting seedlings are a "lucky dip". Seed should be sown as soon as it is ripe, as it rapidly loses its power of germinating.

Vigorous stocks of the lovely old carnation variety Otaki Pink are becoming rare and growers looking for another variety to replace it as a cut flower during summer might like to try Pink Perfection, which has large flowers and long, strong stems, but little scent. Rose Clove is still one of the best winter flowering carnations. The newer Sim varieties are being tried here, but generally they are not a success unless grown in a glasshouse.

Snails can cause considerable damage to all carnations and pinks, and bait should be put down regularly.

Shrubs

Shrubs should be growing well. Any which are healthy but not growing vigorously can be given a little blood and bone. It is better to make two or three light applications during summer than one heavy application.

Shrubs which, though growing well, persistently refuse to flower can be given a light dressing (about 1 oz to the square yard) of sulphate of potash. The possibility that they are growing in the wrong position—with insufficient exposure to sunshine, for example —should also be considered. Incorrect pruning, by consistently removing the flowering wood, can also prevent a shrub from flowering.

Fertiliser should not be applied to South African and Australian shrubs, as most of these grow and flower best on the poorest of soils as long as they are well drained.

Shrubs which tend to produce very long, straggly stems, such as poinsettia, luculia, fuchsia, and lassiandra (*Tibouchina*), may be tipped to promote compact growth. Only the tips of the shoots should be pinched out. Some of the newer varieties of poinsettia are much more compact in habit, though few are yet available in New Zealand. Poinsettias are gross-feeding plants and the biggest "flowers" are grown on well fed bushes. Rotted cow or poultry manure can be used.

Shrubs and trees which were planted last winter must be watered as necessary and mulched. Shading with paper or scrim is beneficial if a small shrub tends to wilt during the day.

Photinia hedges should be clipped early in November to look their best for Christmas, as it takes about six weeks from cutting for the new shoots to develop their young red leaves. Late spring-flowering shrubs, such as forsythia, can be pruned as soon as they finish flowering, the oldest branches being removed entirely or cut back to younger side branches growing near the base of the shrub.

Podalyria calyptrata may be pruned back hard after flowering, though old bushes which have not had this treatment regularly should be treated more gently.

Fuchsias root readily from cuttings only 2 or 3 in. long taken from the tips of young shoots. They will root in water or in a light, sandy soil mixture. Keep them shaded until they are rooted and grow them on in a bush house if one is available.

Continue replacing late spring bedding plants. Water the plants well after planting and if possible transplant them in the evening. Temporary shading where practicable will also help them to become established. If plants have been raised in the home garden, water them well the evening before transplanting.

Sowing Herbaceous Perennials

In warm, sheltered gardens the first sowings can now be made of biennials and perennials, many of which will flower toward the end of the first season. The ground should be well prepared beforehand, and a little bone meal worked in, as this encourages the growth of seedling roots.

The place chosen for the seedbed should be as free as possible from weeds, as some perennials are very slow to germinate and can easily be smothered by strong growth of weeds. Any weeds which germinate should be removed as soon as recognised, as removal later will disturb the flower seedlings too much. If perlite or similar material is used to cover the seeds, it will be easier to see the tiny seedlings in the rows.

Seeds are frequently sown too thickly and too deeply. Small seeds can be mixed with sand, perlite, or dry soil before they are sown, then covered with their own depth of the same material. Water them in with a fine spray and continue watering and shading as necessary until the seedlings are well established.

Hard-coated seeds such as lupin can be soaked in warm water for a few hours to soften the seed coats and accelerate germination; or they can be nicked with a knife to allow water to enter.

Some lilies flower during the first season when seed is sown in October and November, but others take two or more years. Home gardeners can raise many species and hybrids in this way at a much more reasonable cost than buying the mature bulbs. Seedlings are normally free of the mosaic virus disease, so that it is a way of producing healthy offspring from diseased plants, which should be destroyed. The seedlings may not be identical with the seed parent plant, but the variation may be just as attractive for decorative purposes in the home garden.

The lilies should be left in the nursery bed until they have flowered. Any very poor types can then be destroyed and the remainder moved to their permanent position in the shrub or flower border.

Iris innominata can now be divided, though autumn is perhaps a better time where the soil and other conditions are suitable. Division must be done very carefully to avoid losses, as this species has a poor root system. One year old plants are preferable to old clumps.

Iris innominata clumps can be divided now.

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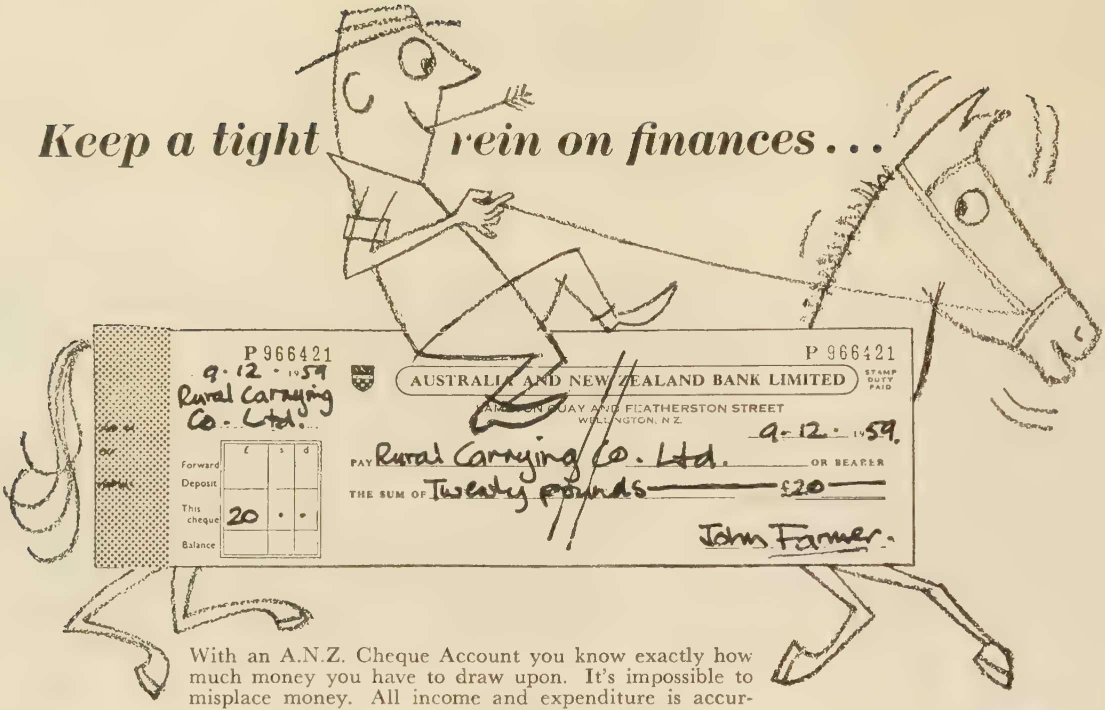

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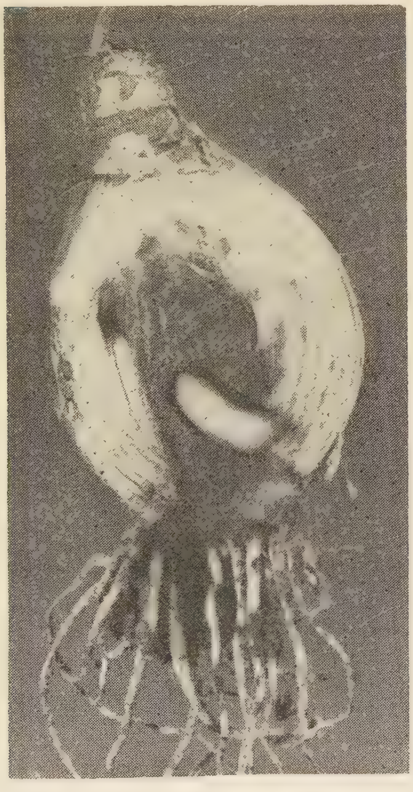
If an old clump has to be divided, only the young actively growing outside portions should be retained and the mass of old rhizomes in the centre should be destroyed. Lift clumps with a large mass of soil so that all the roots within 6 in. of the clump all round are undamaged. Shake or hose off the soil and pull the clump apart with the hands; never use a spade to divide this iris.

Clumps should not be reduced to single pieces of rhizome, but left as three to five pieces of attached rhizome in each division. The divisions should be replanted at once, as they die if they are allowed to dry out. If many clumps are being divided, place the divisions under a damp sack until ready for planting.

Plant in fresh soil if possible; otherwise when the bed is being prepared water the soil with copper oxychloride (1 lb in 10 gallons of water to 5 sq. yd) to reduce the risk of soil-borne diseases. Established plants can be watered with this solution about once a month during the growing season. Plant in a semi-shaded position in soil well enriched with leaf mould or compost. *Iris innominata* can also be raised from seed sown this month, and this is a good method of producing a number of plants with flowers of different colours.

[*Sparrow*

Lachenalias make attractive hanging baskets, flowering in June and July from a February planting.



Bulb attacked by large narcissus fly. Such bulbs feel soft when lifted and should be destroyed.

Pests and Diseases

Pests and diseases are numerous this month on the soft young growth. Roses are subject to rust and mildew, for which a spray of 3½ fl oz of lime sulphur plus ½ oz of colloidal sulphur in 4 gallons of water is required. Powdery mildew is always worse if the plant becomes dry at the roots, so watering and mulching are beneficial.

Brown and bronze beetles are common, eating holes in flower buds and the leaf edges of roses and a variety of other plants. A weekly application of ½ oz of DDT 50 per cent wettable powder in 4 gallons of water should be given. DDT can be added to the lime sulphur spray referred to above. Caterpillars and weevils will also be controlled by the DDT spray.

Aphids multiply rapidly, and should be dealt with as soon as noticed. Soapy water is a mild deterrent, but there are many more effective controls, such as lindane, malathion, wettable powder, and nicotine sulphate, all of which should be used at the weakest dilution recommended by the manufacturers.

Red spider and thrips are hot-weather pests of many plants. Malathion emulsion at 1 fl oz in 4 gallons of water controls both. Spraying with clear or soapy water will also discourage them, as they dislike a damp atmosphere.

Eucalyptus tortoise beetle is becoming more common in the North Island and has been found on a variety of plants. It looks like a tiny tortoise, about ¼ in. in diameter and varying in colour from sandy grey to orange-red. It eats gum leaves and possibly those of other plants.

Bulb flies are on the wing, laying their eggs in the holes left by the dying leaves of narcissus, hyacinth, amaryllis, and iris. Hoeing and drawing the soil up over the bulbs will help to protect them. Dusting with DDT or drenching the rows or groups of bulbs with 1 oz of 50 per cent DDT wettable powder in 6 gallons of water in early December and again two weeks later is a more positive control.

House Plants

These should be growing rapidly, so they can be watered more frequently and given a liquid feed of a proprietary foliar fertiliser about once a fortnight, particularly if pot bound.

Protect them from strong sunlight and do not splash the leaves when watering, as this can cause the development of brown scorched areas in the leaf, particularly toward the tip.

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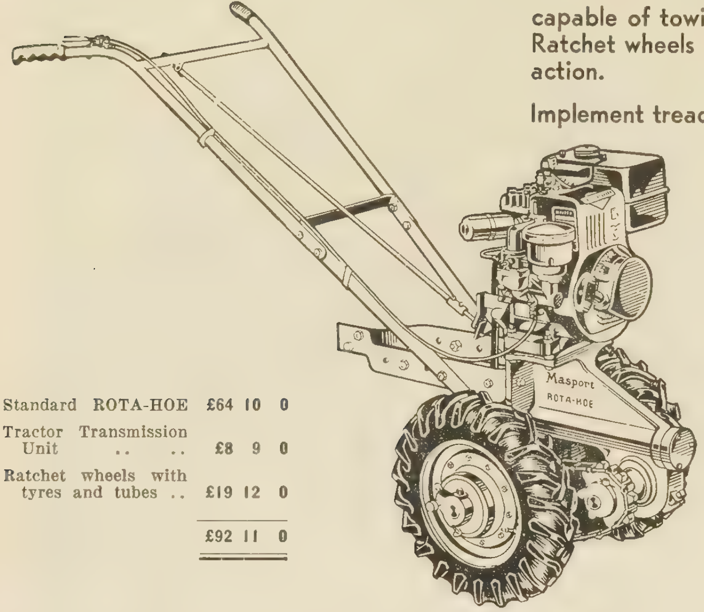

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Editor: A. G. G. Hill

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THE SECRETARY, BRITISH GRASSLAND SOCIETY,

GRASSLAND RESEARCH INSTITUTE, HURLEY, Nr. MAIDENHEAD, BERKSHIRE, ENGLAND.

Apart from being unsightly, such damage can allow the entry of grey mould and other diseases. Propagation of house plants by leaf or stem cuttings or division can continue.

Pot plants for exhibition at shows should appear robust and healthy with clean, undamaged foliage preferably covering the top of the pot. Foliage which is scorched or distorted is undesirable, but evidence of removal of damaged leaves will also be a disadvantage. Growth should be even all round.

Flowering plants are generally considered slightly superior to non-flowering types in open competition, as more cultural skill is usually required to bring them to the full-flowering stage for the date of the show. The flowers should be numerous, evenly distributed, and held well above the leaves so that they are easily seen. The individual flowers on the plant should be of good quality and texture, well formed, and with a good, bright colour.

Hanging Baskets

Home gardeners may like to have hanging baskets to decorate their verandas, bush houses, or glasshouses, but problems of planting and watering have to be overcome if the baskets are to look really attractive.

The container is of galvanised wire and this should first be lined with a sheet of clear plastic, a few holes being made for drainage at the bottom. Closely packed moss was formerly used, as it held the moisture and prevented the soil from trickling through the wire mesh. It can still be used in a thin layer to line the plastic, giving a more attractive finish to the basket when viewed from below.

Pot-grown plants are the easiest to transplant into a basket and several can be packed in if they are in small (2½ in. to 3½ in.) pots. The central plant is placed upright with the others spaced out round it at an angle. A good potting mixture is placed in the bottom and firmed down, then the plants are knocked out of their pots, crocks removed, and bottom roots loosened a little before the plants are placed in the basket. More potting soil is then firmed down round the root balls until the basket is filled to within an inch of the rim. The new soil should be as firm as that in the root ball; otherwise the latter will not be wetted when the whole is watered. Care should be taken that the plants are kept in the same level in the soil as that in which they were formerly growing. The surface of the soil should dip slightly in the centre and the moss and plastic should continue to the rim of the basket to facilitate thorough watering.

If potted plants are not available, suitable plants can be lifted with a good ball of soil from the open ground and planted in the same way as above. If seedlings or rooted cuttings are used, the basket should be filled with potting mixture, and the plants put into it in the same way as when they are planted out in the garden. The basket is usually handled more easily if it is supported in the top of a large flower pot, can, or box during planting.

Suitable plants are those with a naturally lax or pendulous habit, such as fuchsia, trailing lobelia and petunia, ivy-leaved geranium, some begonias, *Asparagus sprengeri*, *Panicum variegatum*, chlorophytum, ferns, wandering jew, heliotrope, *Campanula isophylla*, and *Saxifraga sarmentosa.* They should be chosen according to the position they are to occupy, those which appreciate a shady moist atmosphere being used for the bush house and those which can stand hot sunshine and dry conditions for the veranda.

Watering should be done regularly, possibly every day in midsummer. If the soil becomes very dry, the whole basket should be placed in a tub of water for an hour or two and then the surplus water allowed to drain away. Baskets lined with plastic do not need such frequent watering as those made up in the traditional manner. As for pot plants, the soil should be kept neither sodden nor dry, but just damp. Water with one of the proprietary foliage feeds once every two weeks throughout summer to maintain vigorous growth.

The baskets should be hung above head height if they are over a pathway, but they should be easily accessible for watering and spraying. This can be arranged by hanging the basket by a rope which passes over a pulley to a hook on the wall.

Bulbs, particularly lachenalias, can look very attractive in baskets. The basket is first lined with moss, then the bulbs are placed fairly close together facing toward the outside of the sides and bottom of the basket. Fill the basket with potting soil, placing a 5 in. pot in the top, cover with a board or tile, and turn the basket upside down. At the same time plant five bulbs in a 5 in. pot and grow them alongside the basket. When the bulbs are in bud, invert and hang the basket and replace the empty 5 in. pot with the one full of bulbs. Within a few days the basket will have the appearance of a globe of flowers.

Floral Decoration

Gerberas should not be picked until that part of the stem immediately below the flower is firm, that is, about two days after the flower is apparently fully developed; otherwise the head will droop.

Roses last longer if they are picked in the late afternoon, with one or two petals unfurled from the bud. Slit the stem and scrape the bark for about an inch from the base with a sharp knife, and place immediately in cold water so that the whole stem is immersed. If there is any delay between cutting and placing in water, recut the stem under water, removing about half an inch. Leave in a cool place overnight. This may seem rather a lot of trouble, but it ensures that the roses will last for a reasonable time. After being arranged they should be placed in as cool a place as possible, out of the sun and out of draughts.

Single specimen blooms of a new or favourite variety look well in the small silver or crystal vases designed for the purpose.

With such a wealth of flowers available, it is a good time to experiment with all types of flowers and foliage, mixing and blending colours and trying various styles of arrangement which may be unfamiliar. If the flowers themselves do not suggest sufficient ideas, guidance can be obtained from illustrated books from libraries and bookshops.

Book Review

"The History of the Loder Cup"

THE Loder Cup, named after its donor, Mr Gerald W. Loder (later Lord Wakehurst), is in the terms of the award "offered to lovers of nature in New Zealand to encourage the protection and cultivation of the incomparable flora of the Dominion".

The award of the cup is vested in the Minister of Agriculture, who appoints the Loder Cup Committee to assist him in selecting suitable recipients.

The award of this cup is highly regarded, and many persons noted for their activities in the preservation or the development of interest in native flora have won it.

The Loder Cup Committee has now published this attractive history of the first 25 years' awards.

This well illustrated book is a worthy record of the recipients and of the many other persons associated with the award. It is most valuable in providing a factual history before the information becomes forgotten or distorted by time, and it should encourage many others to work for the objects of the donor.

—*J.P.S.*

Published by the Loder Cup Committee; obtainable from the Royal New Zealand Institute of Horticulture (Inc.), P.O. Box 450, Wellington. 5s.

The Value of Milk in Your Diet

By PATRICIA M. de LAUTOUR,
Home Science Instructor,
Department of Agriculture,
Palmerston North

THROUGHOUT Nature there is widespread recognition of milk as a valuable food. It is almost unique among animal foods because it contains all three nutritive constituents (protein, carbohydrate, and fat) with fair quantities of minerals and vitamins. In other words it contains the materials that children need for growth, those that young and old alike need for the repair of their body machinery, and those that all need for fuel to provide the heat and energy necessary for work. Yet this does not mean that milk contains these ingredients in such proportions that it will be satisfactory as the only food for an adult or even for a child.

THAT milk is an ideal food for babies and for all young animals is evident from the fact that Nature herself provides it, but milk is deficient in one important mineral, iron, and so a good source of iron must be added to the diet as soon as the child reaches the age where the store of iron it has been born with is used up.

NUTRITIONAL VALUE OF MILK

Milk is 87 per cent water, so it would be necessary for an adult to have five or six quarts a day to meet his energy requirements, and unnecessary quantities of protein would then also be consumed. Furthermore, the digestive organs of a healthy person past babyhood do their best work when at least part of the food contains cellulose or roughage such as in vegetable foods.

Because it contains so many substances essential to health, milk is classed as a protective food with eggs, vegetables, fruit, and meat.

Proteins

Proteins are essential for the growth and repair of our body tissues and for this reason are extremely important at times of maximum growth, for example, childhood and pregnancy. The proteins, **casein** and **lactalbumin**, present in milk, are particularly valuable and belong to the group termed complete proteins because they contain the factors necessary to repair or maintain our body tissues and to build up new ones. Thus, though milk contains only 3.5 per cent of protein, it is of such high biological value that milk is regarded as an excellent source.

Milk and eggs yield the best body-building protein and both foods are readily digested and assimilated and easily mixed with other foods in any dietary. They are therefore of great value for invalids and for growing children. Milk products such as cheese also contain protein of high biological value.

Excess protein in the diet is used wastefully to produce heat and not for body building. If carbohydrates are not served at the same meal as protein, the liver will burn the protein to form sugars which are used for energy, and it is then useless for body building or repair. Thus bread or potato should be served with milk, meat, fish, and eggs. The maximum benefit from proteins is obtained when they are served in small quantities frequently and with other foods.

Skim milk has a higher percentage of protein because of its low fat content and is therefore valuable for people who are slimming.

Carbohydrate

The carbohydrate in milk is **milk sugar or lactose**, which is present to the extent of from 4 to 5 per cent. Lactose differs considerably from cane sugar in that it is comparatively free from sweetness and so does not readily pall the taste. It does not ferment easily and thus is useful in some stomach disorders. However, it is easily soured and to prevent this, milk should be kept in a cool place. As the percentage of carbohydrate is so small, milk should be used in conjunction with food rich in that constituent, for example, bread.

Fat

The fat in milk is in the form of an emulsion of extraordinary perfection—the fat is so finely divided that it must be easy to digest. When milk is left to stand, the globules are inclined to run together and float to the top as cream. This is overcome by homogenisation of the milk by which the fat globules are distributed evenly throughout. The last drop of milk contains as much fat as the first and very little will rise to the surface even after the milk has stood for 48 hours. Thus the vitamins A and D which are present in the fat are evenly distributed throughout the milk.

Summary

FROM this article you will see that though milk is not a perfect food, it is high on the list of sound foods and can rightly be termed the most important single food.

It supplies first-class protein. The fats present are readily assimilated and the carbohydrate or milk sugar is very useful in metabolism. It is an excellent source of calcium and phosphorus but is deficient in iron. Though it contains negligible amounts of vitamins C and D and only slight amounts of B_1, it is a good source of vitamins B_2, A, and D.

No other food apart from eggs is of such high nutritional value, though because of the high percentage of water it contains, it is too bulky to be satisfactory as the sole food, but is very valuable in supplementing the deficiencies of other foods in the diet.

It is a cheap source of first-class protein—one quart of good milk is equal in calorie value to a pound of lean beef steak.

Many find homogenised milk easier to digest, as it does not cause distress due to a feeling of overfullness and it is particularly suited for hospital dietaries.

Minerals

The mineral elements, apart from iron, are fairly well represented in milk and those present are particularly suitable for building up muscles and bones, for example calcium and phosphorus. Babies are born with a supply of iron, but they must soon have a good source, such as egg yolk, added to their diet.

Because **calcium** is necessary for the building up of bones and teeth, it is particularly important for young children and for expectant and nursing mothers, though it is being used all the time by the body to keep the bones and teeth strong and healthy. Consequently everybody needs a good supply throughout life. It also helps in the clotting of blood and is essential for the proper functioning of every cell in the body, for muscular action, and for the tissues of the brain and nervous system.

As calcium is not very widely distributed in food, milk is our most important source. The average consumption of milk per head in New Zealand has increased over the past 20 years and adults should try to ensure that they have 1 pint per day and children should have at least 1½ to 2 pints per day. Some people are unable to take milk and it should never be forced upon them. Others dislike it and for them it can be disguised in tea, coffee, cocoa, soups, or milk puddings.

Other good sources of calcium are cheese and salmon, and eggs and vegetables contribute small amounts.

Unfortunately, calcium on its own is of no great value to the body, as it cannot be utilised unless adequate quantities of phosphate and vitamin D are also present.

Phosphorus, beside playing an important part in the formation of bone, is also essential for the production of energy from food, and is an important constituent of all cells. It is more widely distributed in food than calcium and thus not so liable to be lacking from the average diet. Again, milk is an excellent source, and can be supplemented with cheese and eggs.

To make use of both these minerals the body must also have an adequate supply of vitamin D.

Other minerals present in milk are **magnesium**, **sodium**, **potassium**, **sulphur**, **chlorine**, **manganese**, and **copper**, all of which play a part in keeping us alive and well.

Vitamins

In comparatively recent years medical research has shown the value of a group of dietary essentials to which has been given the name vitamins. Each vitamin has a specific function to perform in the body. The B group of vitamins, for example, are essential for the conversion of food into heat and energy; if they are absent, food is incompletely utilised.

If any one of them is lacking in the diet, it usually results in a deficiency disease, so called because it is due to the lack of one particular substance.

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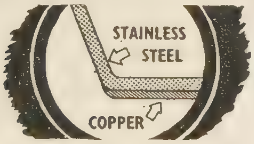

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PREPARE FOR THE JOB

by wearing the correct protective clothing. Be sure you *cover up* from gloves to respirator or mask for certain jobs. The Departments of Agriculture, Health or Labour can advise on equipment.

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Don't eat or smoke when working, poison may get on the face or mouth. Avoid spraying in windy weather. Serious absorption through the skin can occur if clothing becomes wet or if sprays are breathed in or swallowed.

WASH, WASH, WASH—

One of the most vital safety measures. Wash thoroughly before eating, drinking or smoking and bathe thoroughly after work. Then change into clean clothes and wash work clothes thoroughly,

CARE FOR YOUR EQUIPMENT—

Wash goggles and face-pieces of respirators (as well as other clothes used). Store the former in a clean, dry place, preferably in a tightly closed paper or cellophane bag.

GET A DOCTOR WITHOUT DELAY

at any sign of headache, dizziness, blurred vision, nausea, stomach cramps, tight chest. Give first-aid as outlined on the container.

DESTROY CONTAINERS—

Burn or bury them — well out of the way of children or pets.

10.8

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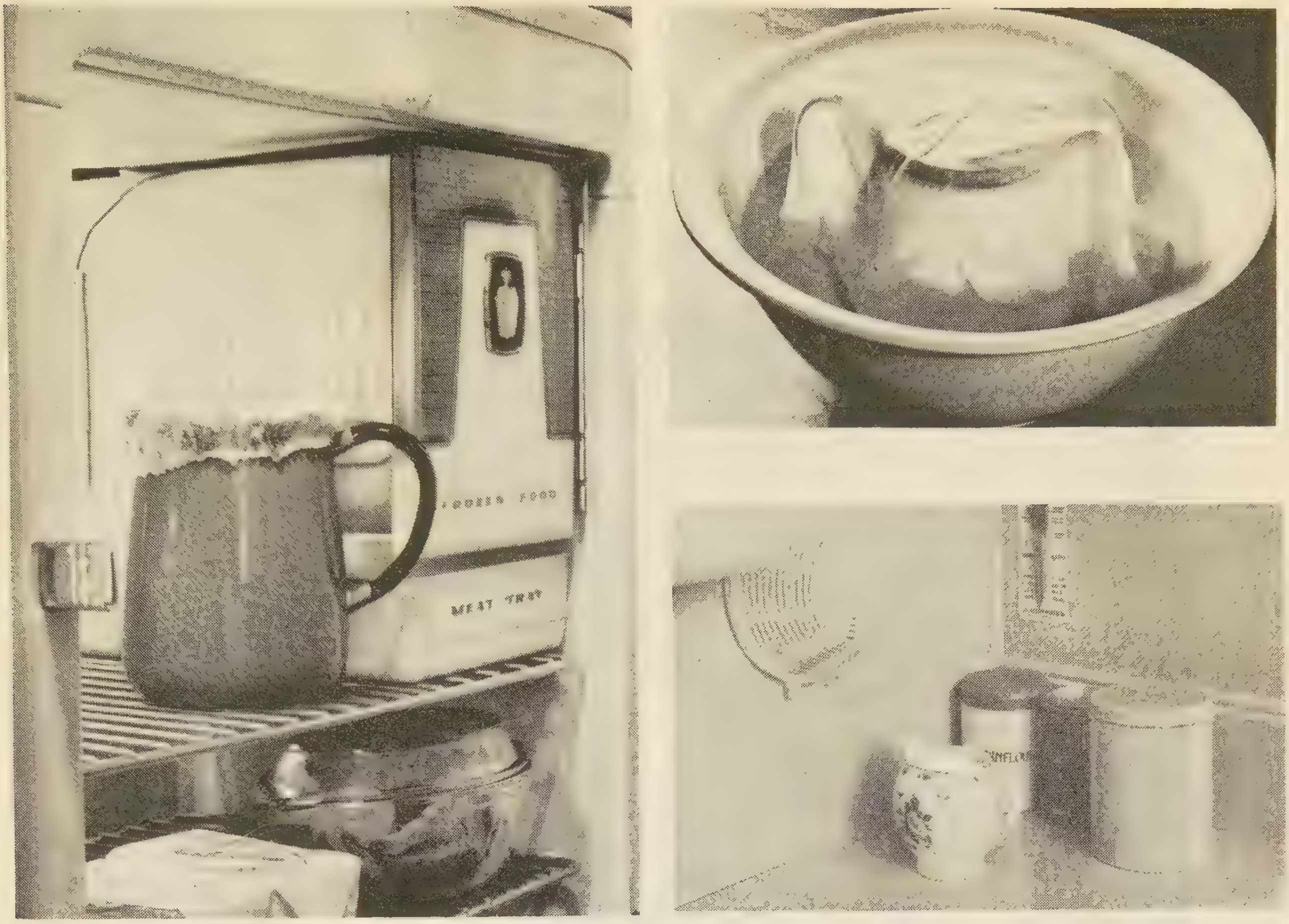

ABOVE LEFT: Milk as it should be kept—covered and in a refrigerator. UPPER RIGHT: If a refrigerator is not available, milk should be kept covered in a cool, dark place. Set the jug in a basin of water and cover with damp muslin. Make sure the ends of the muslin are dipping in the water. The muslin will stay moist and keep the milk cool by removing the heat from it as the water evaporates from the muslin. LOWER RIGHT: Milk as it is too frequently kept—uncovered on a bench in a warm kitchen atmosphere, and exposed to flies, dust, and bacteria.

Scurvy, which is due to an insufficiency of vitamin C, was probably the first deficiency disease to be recognised.

Vitamin A is found in milk in combination with the fat and it is this vitamin which is responsible for the maintenance of the healthy mucous membranes which form linings for various organs, particularly the respiratory system. For this reason it is frequently referred to as the anti-infective vitamin. Lack of it is the chief cause of preventable blindness among children in some Asiatic countries. Night blindness is also caused by a shortage of vitamin A.

Milk is a good source of **vitamin B_2** (riboflavin), but unfortunately this vitamin is readily destroyed by light and will be lost unless milk is stored in a cool, dark place, preferably a refrigerator.

Small amounts of **vitamin B_1** (thiamin), and **vitamins C** and **D** are also present in milk. A certain amount of vitamin C may be lost during pasteurisation, but light, particularly sunlight, has a much more destructive effect on milk than modern methods of pasteurisation.

CARE OF MILK

For the very same reasons that milk is an ideal food for humans, it is also an ideal food for bacteria and thus it is essential that it should be handled carefully.

Milk as it comes from the healthy cow is almost sterile, but this state is impossible to maintain. The only remedy is to treat the milk before consumption. The two ways of treating milk to make it safe are by pasteurisation and by boiling.

In pasteurisation the milk is heated to a temperature of 142 degrees F, held there for 30 minutes, then cooled quickly. This kills all the harmful bacteria without materially altering the food value. Most of the vitamin C is lost and about 10 per cent of vitamin B_1, but as milk is not a good source of either, this loss is not important.

Sources of Infection

Sources of danger are disease in the cow and contamination with disease-causing organisms during production, transit to the depot, and delivery to the consumer. The cow could be suffering from tuberculosis or undulant fever and transmit these to the milk. The milker may be a carrier of typhoid, diphtheria, dysentery, paratyphoid, or scarlet fever and so infect the milk. Containers such as buckets

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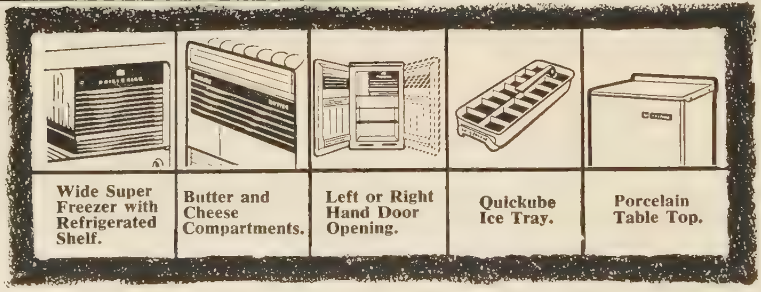
Here's a new addition to our family of Frigidaire refrigerators—a worthy heir to the Frigidaire tradition of built-in quality and work-saving features. You'll be delighted with this space-saver with the adult capacity for food—it's the baby your kitchen has always wanted—and it's a genuine Frigidaire! Compact in design—only 24 inches in depth and width, the 5 cu. ft. Frigidaire is available with either right or left hand opening door—both with or without porcelain table top.

Small outside and roomy within, these new models incorporate many worthwhile Frigidaire features including adjustable shelf, safety seal door, cushion seat gasket. Then, too, the new "fives" have a special egg shelf, roomy door shelves, automatic interior light, ball bearing door hinges. Exterior is finished in snowy white high baked Dulux enamel.



Wide Super Freezer with Refrigerated Shelf. **Butter and Cheese Compartments.** **Left or Right Hand Door Opening.** **Quickube Ice Tray.** **Porcelain Table Top.**

Price £82.10.0 — — with table top £85.

F

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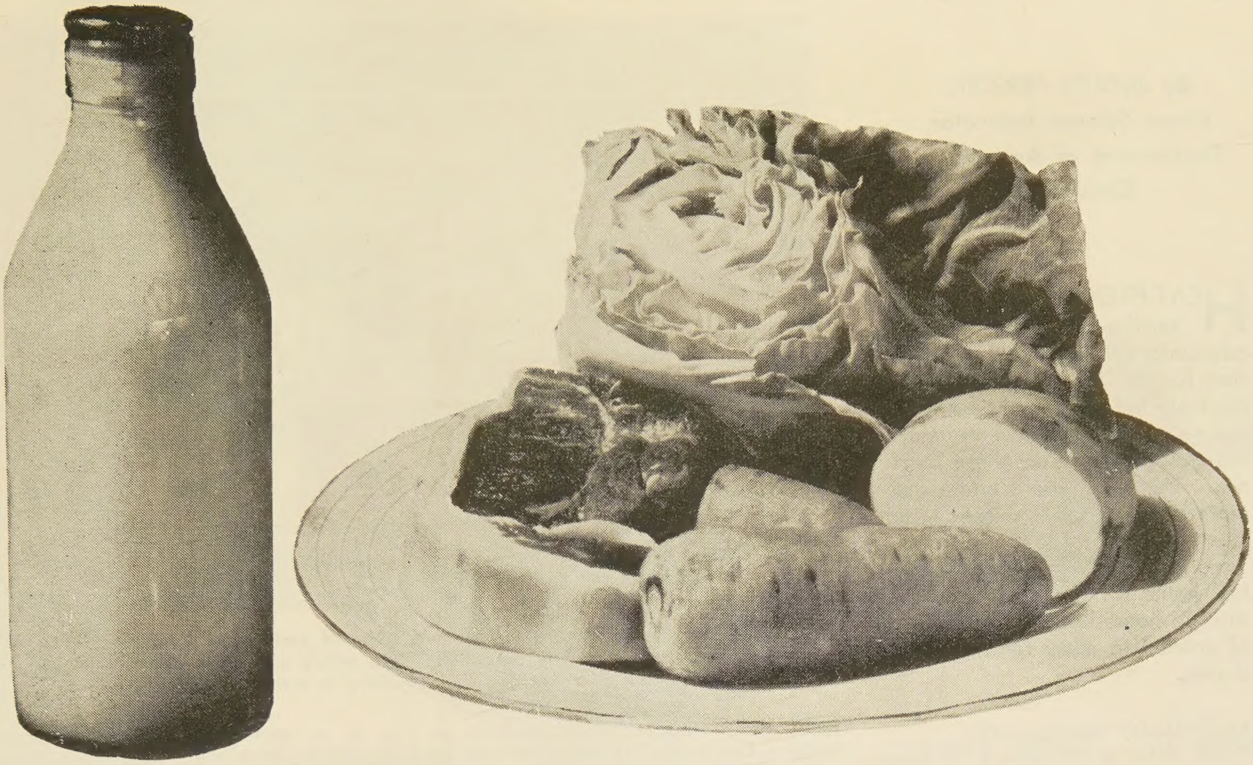


▲ One pint of milk, though not equivalent in vitamin and mineral content, is equal in protein, fat, and carbohydrate value to a plate of meat and vegetables.

or cans may be washed with water that has been infected with pathogenic germs or germs may be transmitted by flies. There is also a danger of contamination by dust.

It is therefore very important that milk should be handled carefully and where pasteurised milk is not available, it should be boiled. This is particularly important for babies and children. All utensils used for milk should be cleaned very thoroughly and all dairy utensils should be carefully scalded. Care of milk does not end in the dairy, however, nor in the milk treatment station. The housewife, too, must be very careful.

In the Home

Milk should always be kept covered to prevent the entry of bacteria from the atmosphere and against flies. Wherever possible it should be kept in a refrigerator to prevent the growth of any bacteria that might have found their way into it. Pasteurisation kills only germs that were in the milk before it was treated. It does not prevent the growth of any that may infect it after the bottles have been opened.

If you do not have a refrigerator, store the milk in a cool, dark place, as light destroys the valuable vitamin B_2 (riboflavin).

ADVANTAGES OF MILK

Digestibility and Absorption

During digestion milk passes rapidly to the stomach, where it is clotted by digestive enzymes before passing into the intestine where digestion is completed by the pancreatic juice. The fat and sugar are absorbed very readily, as is the protein, even more so than that of meat.

Milk is absorbed better when it forms part of a mixed diet than when taken on its own, and it is absorbed better by young people than by adults. Boiling it does not interfere with either its absorption or its digestibility.

As it is absorbed in the intestine more readily than any other food and has a restraining influence on putrefaction, it is of great value in dealing with intestinal diseases.

As a Food in Illness

No single food is of such great value as milk in illness and some of its disadvantages in health can be turned to advantage.

Because it is fluid, it is easy to swallow and this is a great help to exhausted patients. The quantity taken is also easy to regulate and measure. It can be used in place of other beverages and a glass of milk with each meal increases the amount of food a patient is taking. It is often recommended to people who need to put on weight.

As milk contains a high percentage of water, it helps to quench thirst, but unlike water, it supplies food at the same time.

One of the disadvantages of milk as a food for healthy people is its bulkiness, but this is not a drawback in most illnesses because the patient is warm and at rest in bed and therefore requires much less food than an active person. Besides, concentrated foods are not so well tolerated in severe diseases and a moderate degree of dilution is an advantage.

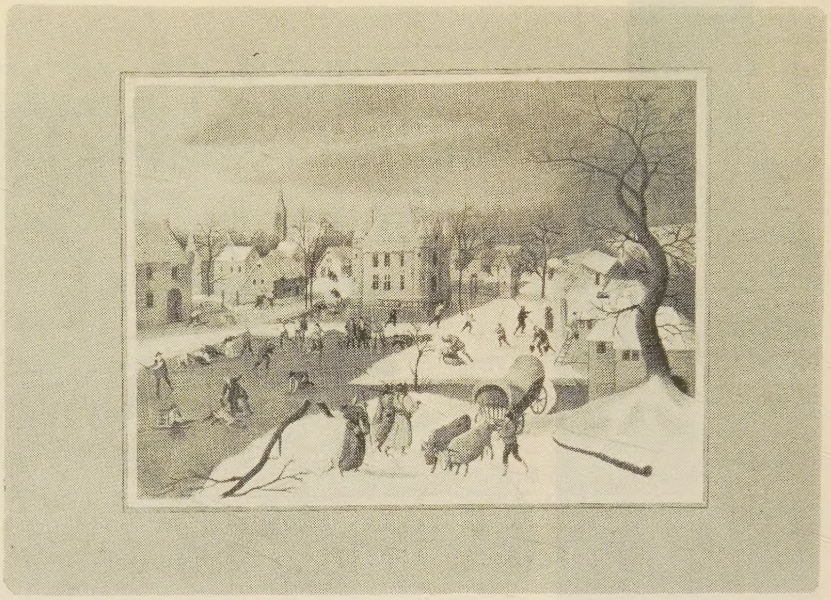
As milk requires less effort to secrete and is more easily absorbed than any other food, it is of special value in gastro-intestinal disorders.

Possibly, if taken in very large amounts, it might cause constipation, but this could be due rather to the lack of exercise while in bed.

Protect Your Table with These Decorative Mats

By JUDITH FERRIER,
Home Science Instructor,
Department of Agriculture,
Christchurch

HEAT-PROOF, easily cleaned hardboard mats provide adequate and attractive protection for the table against marking from hot plates. Apart from the patience needed when painting the gold border, these mats are easily made and use materials probably already in most farm storerooms or sheds. Time required amounts to one to two hours for each major stage with 24 hours between the coats of enamel to allow for thorough drying.



One from a set of eight mats which have seasonal pastimes as a unifying theme. It was made by the method described in this article and shows clearly the need for neatness and accuracy in making.

MATERIALS required are:

Off cuts of hardboard in pieces big enough to cut eight mats 8 in. x 11 in. An additional mat cut larger would be useful for the meat plate.

Illustrations: Cut these from magazines, garden catalogues, travel folders, "non-Christmassy" Christmas cards, etc., printed on good-quality paper. A set of black and white etchings would look effective with a bright border. Pictures should have some common theme and be of similar size.

One small tin of heat-resistant enamel. Choose a colour which will be a good surround for the pictures and which will tone with the china and the dining room colour scheme.

One small packet of ready-to-mix gold paint.

One small tin of clear varnish.

Size.

Fine sandpaper.

Paint brushes (one for the size, enamel, and varnish and a water-colour brush for the gold paint).

Two-thirds of yard of 33 in. felt (as sold for covering card tables).

To Make the Mats

On the hardboard rule eight rectangles 8 in. x 11 in. with true right-angled corners. Cut with a fine-toothed saw from the right side (smooth surfaced) so that any chips will be on the under side of the mats. Have these finished with a plane to smooth the edges. Finish further by rubbing with fine sandpaper, using it to round each corner slightly.

Apply two coats of size to the surface and edges, allowing it to dry between coats. For this, use one part size to 10 parts water. Soak the size in a little of the cold water for 30 minutes to soften it. Add the rest of the water boiling. Brush the size on hot with a clean brush.

When it has dried, paint the surface of the mats with a **thin** coat of heat-resistant enamel. Use only a little on the brush at a time and brush in all directions to achieve a complete coverage. Too much paint will make it difficult to eliminate the brush marks. Allow this to dry for 24 hours. Repeat with a second thin coat of enamel which need cover only the part which will show round the illustration. Allow to dry for 24 hours.

Illustrations

If possible, cut out the pictures with an ⅛ in. surround to give a more complete appearance. Measure to place the picture in the centre laterally and have it closer to the top than the lower edge of the mat. Should the illustrations vary in size, place them all the same distance down from the top edge to give some uniformity. Mark the corners of one side and the top of the picture on the board. Rule across the top line with lead pencil, as it is easier to place the sticky pictures against a line than to fit them into four corner marks.

Paste the backs of the pictures rather than use a size glue which dries too quickly, often before the pictures are correctly placed. Smooth out from the centre to flatten air bubbles and allow to dry overnight. Rub out any pencil marks visible.

Painting and Varnishing

Paint the sides of the mats with the gold paint, doing two at a time on each mat and allowing these to dry before completing the other two. Work from the back of the mat with a full brush which will coat the sides evenly and show only a very narrow gold line on the top.

Coat the surface with clear varnish. Allow to dry and apply a second coat.

Backing

Cut the felt into rectangles slightly smaller than the 8 in. x 11 in. mats and glue in place on the back of the mat with a size glue made from one part size to two parts water. Allow the size to soften in cold water for 30 minutes, then heat over boiling water, stirring all the time until dissolved. Do not allow the glue to boil. Apply hot to the back of the mat, then press the felt on to it. Very quick work is essential, as the glue hardens in no time. Any edges which show can be trimmed off with a razor blade.

Printed by Blundell Bros. Ltd. (The Evening Post), Wellington—12117

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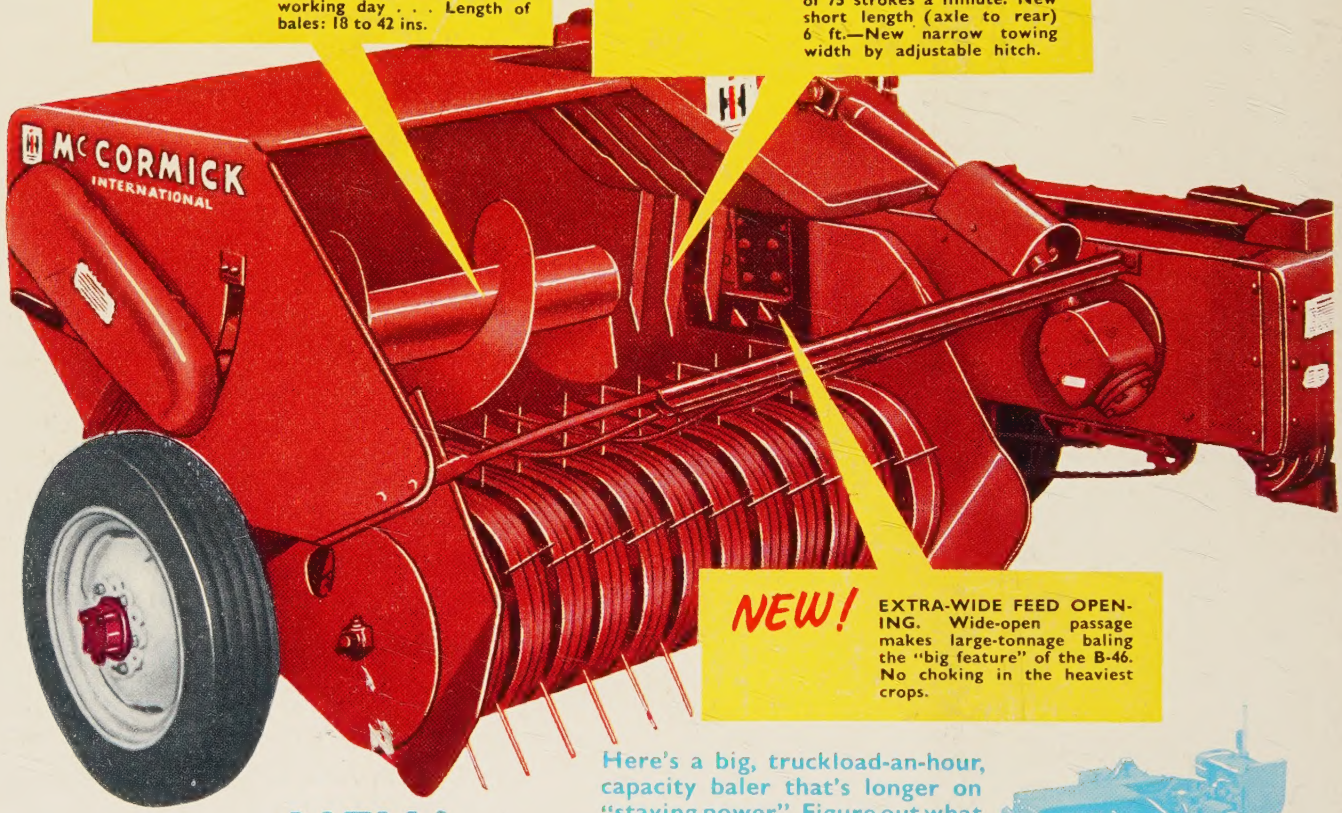

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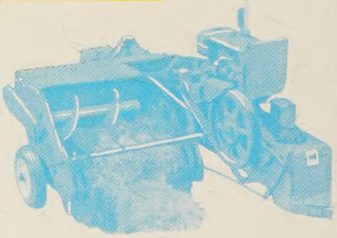

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